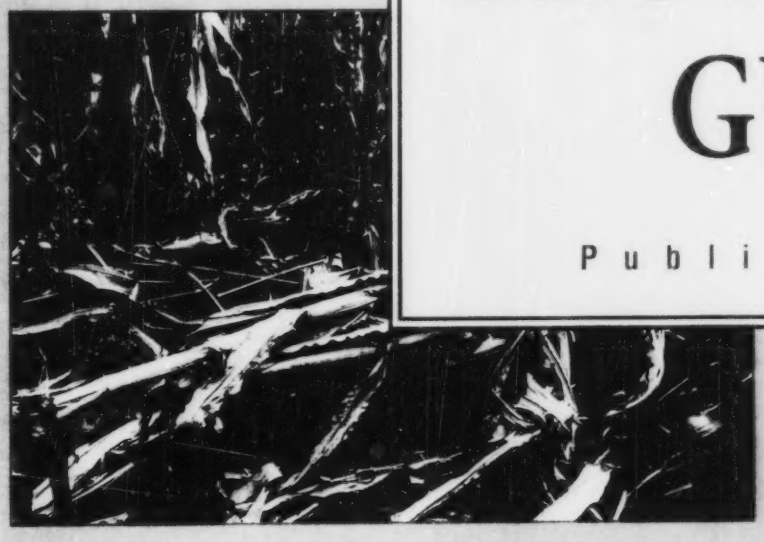
FIELD CROP PROTECTION GUIDE

Publication 812



Ontario

MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS

Each year the appropriate sub-committee of the Ontario Pest Management Research and Services Committee reviews the pesticides listed in this publication. To the best knowledge of the sub-committee, all of these pesticides were:

- federally registered
- reviewed by the Ontario Pesticides Advisory Committee (OPAC) and
- classified by the Ministry of the Environment as of November 2000

Discard old editions of this publication.

The information in this publication is general information only. All pesticides must be used in accordance with the product label and Regulation 914 under Ontario's *Pesticides Act.*

Pay close attention to all instructions and warnings on the pesticide label.

By printing this publication, the Ministry of Agriculture, Food and Rural Affairs does not offer any warranty or guarantee, nor does it assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

Policy Statement

In this publication, most recommendations list several pesticides that can be used for each pest discussed. In general, the least hazardous materials and those growers have used satisfactorily for years are listed first. More toxic pesticides and/or newer ones with less practical grower experience follow. In some cases, the most effective pesticides are highly toxic.

This publication lists a number of brand names of pesticides. This is for the grower's convenience only. It is neither an endorsement of the product nor a suggestion that similar products are ineffective.

Weather and other factors influence the effectiveness of pesticides and the likelihood of crop injury by pest control chemicals. Consult the product label and other information regarding compatibility with other materials, the effect of environmental conditions, and so on for the specific product being considered. Wettable or soluble powders (WP, SP, WDG or DG) are less likely to cause plant injury than liquid concentrates (EC, SC and F).

Health Canada has established maximum residue limits (MRLs) for pesticides. However, growers should be aware that processors or retailers may demand more restrictive limits. Growers should seek advice of their intended market as to which restrictions or limitations apply. Growers are also encouraged to keep accurate and up to date records on pesticide use in each crop.

Federal Registration and Provincial Classification

The Ministry of the Environment administers Ontario's *Pesticides Act* and Regulation 914.

All pesticides sold and used in Ontario must be:

- registered under the federal *Pest Control Products Act*, and
- classified under the provincial *Pesticides Act* by being placed in one of six schedules of the Ontario regulation.

Federal Registration

The Pest Management Regulatory Agency (PMRA) of Health Canada grants registration following an evaluation of scientific data to ensure that the product has merit and value; and the human health and environmental risks associated with its proposed use are acceptable.

1. **Full Registration**
   Pesticide registrations are normally granted for a period of five years, subject to renewal.

2. **Temporary Registration**
   Temporary registration may be granted for a period not to exceed one year, where the registrant agrees to produce additional scientific or technical information, or the pesticide is used for emergency control of a serious pest outbreak.

For more information on the federal registration system contact the PMRA at 1-800-267-6315 or www.hc-sc.ca/pmra-arla.

Provincial Classification

There are six classification schedules in Regulation 914. Pesticide products are classified based on their toxicity, environmental or health hazard, persistence of the active ingredient or its metabolites, concentration, and usage. This system regulates the distribution, availability and use of pesticide products in Ontario. For up-to-date information on the regulatory status of these or other pesticides contact the:

Ontario Pesticides Advisory Committee (OPAC),
2300 Yonge St., Suite 1203, Toronto, ON, M4P 1E4
Telephone (416) 314-9230 Fax (416) 314-9237
www.opac.gov.on.ca

Farmer Certification

Regulation 914 of the *Pesticides Act* makes it mandatory for farmers to be certified through the Grower Pesticide Safety Course to buy and use Schedules 1, 2 or 3 pesticides on land they farm. There must be at least one Certified Grower for each farm operation.

As of January 2000, all assistants must receive formal pesticide safety training, recognized by the Ministry of the Environment, before they can use Schedule 2 or 3 pesticides under the supervision of a Certified Grower. This applies to all assistants — including family members, farm employees and seasonal workers.

For more information check the Ontario Pesticide Education Program Web site at www.ridgetownc.uoguelph.ca/opep/ or call 1-888-652-8873 or (519) 674-1580

Cette publication est aussi disponible en français.

Ontario

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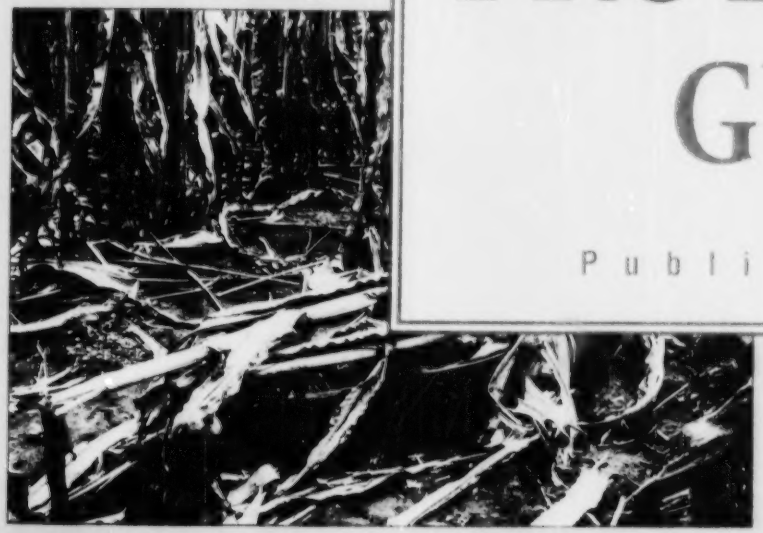

MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS

The *Field Crop Protection Guide*, Publication 812, along with the *Agronomy Guide*, Publication 811 replaces *Field Crop Recommendations*, Publication 296, which will no longer be in circulation. Please discard any copies of Publication 296. The *Agronomy Guide*, Publication 811 will be available Fall 2001.

Acknowledgments

The recommendations contained in this publication have been supplied under the direction of the Field Crop Technical Working Group, a subcommittee of the Ontario Field Crop Research and Services Committee, and the Ontario Pest Management Research and Services Committee, and personnel of Crop Technology, OMAFRA, the University of Guelph and Agriculture and Agri-Food Canada.

Need technical and business information?

Contact the Agricultural Information Contact Centre at
1-877-424-1300
or ag.info@omafra.gov.on.ca

Looking for field crop production information on the Internet?

www.gov.on.ca/omafra/english/crops/index.html

It's one-stop shopping for factsheets, articles and photos regarding the production and maintenace of field crops.

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1. Precautions With All Pesticides

General Precautions

- Before beginning work with pesticides make sure someone knows where you are working and what pesticides you are handling. Post the telephone number for your Poison Information Centre near your telephone.
- When handling pesticides, have clean water nearby at all times and keep an extra set of coveralls close in case the material spills on yourself.
- Before opening pesticide containers, always read the label and follow all precautions and directions.
- Keep a record of the common names of all the pesticides you handle, especially those listed as hazardous in this publication. Other members of your family need to know where this list is in case of an accident.
- Never smoke, chew tobacco or eat while handling or applying pesticides. Never carry tobacco or food in your clothes while spraying.
- Change your clothes and wash before you eat.
- When handling and mixing pesticide concentrates, rinsing empty containers or repairing leaks, wear a full set of protective clothing. This includes a waterproof cap, coveralls, chemical resistant gloves and boots, and safety goggles.
- Wear a respirator if using highly or extremely toxic pesticides or very dusty formulations. Never wear a dust mask. These types of masks do not protect you from pesticides. You must wear a respirator if handling volatiles or gases. If these gases are highly dangerous or you are handling them in an enclosed space, you may need a self-contained breathing apparatus. Make sure you follow the instructions on the product label.
- Use an anti-backflow device to prevent back-siphoning when drawing water from wells, ponds, streams or other sources.
- Mix pesticides at least 50 m from wells, ponds or streams. Triple or pressure rinse the empty container and add the rinse water to the tank. Only mix enough solution to do the spray job. When loading and mixing are finished, wash gloves and boots with soap and clean water before removing them.

Always read the product label and follow the safety instructions.

- When applying pesticides, use a tractor cab with an activated charcoal filter for protection against respiratory exposure. Do not contaminate the cab area by wearing pesticide contaminated protective clothing and equipment.
- Wear the appropriate respirator, chemical resistant gloves, boots, coveralls and waterproof head covering when tending to the sprayer.
- When using airblast and mist blowers or tractors without cabs, wear the appropriate respirator, waterproof suit and head covering, and chemical resistant gloves and boots. Once spray application is completed, clean both those areas of the tractor contacted by spray and your protective equipment. Do not operate the tractor without wearing protective clothing and equipment, unless it has been decontaminated.
- When applying fumigants in the field, have a respirator on hand in case you need to deal with equipment problems or in case inadequate sealing in the soil allows the fumigant to escape.
- When the spray operation is completed, wash hands with soap and water before entering pesticide free areas. Bathe or shower to remove pesticide

deposits on your skin. Do not handle anything in your home before you bathe.

Preventing Contamination of Farm Water Supplies

Pesticides can contaminate well, pond and surface water. It is an offence to contaminate surface waters with pesticides. Taking the following steps will help prevent contamination.

- Keep pesticide concentrates above any flood plain in locked storage.
- After emptying containers, triple or pressure rinse, crush and disposed of the containers according to product label instructions.
- Return empty plastic or metal containers to a dealer who participates in the container-recycling program. Empty bags may be burned or disposed at a landfill site.
- Mix pesticide and load the sprayer at least 50 m away from any water supply.
- Use buffer zones and berms to avoid contaminating surface water, wells, ponds and/or streams.
- Do not use drinking water sources to fill spray equipment. If you fill your tank from a well, lake, river or other surface water source, you must use an anti-backflow device.
- Do not spray within 10 m of shallow wells or 5–10 m of other water supplies in ideal weather and farther away if there is any air movement. Stop spraying when wind velocity reaches 10 km/hr.

If An Accident Occurs

1. **Always protect yourself from injury first.** Don't become another victim. Always put on protective clothing and equipment before you enter a contaminated area or handle a contaminated victim.

   If clothing becomes wet with a pesticide, remove it immediately, wash/bathe yourself and put on fresh clothes.

2. Check to see if the victim is breathing.

   If the victim is not breathing:
   - ❑ Straighten the victim's airway and check for breaths.
   - ❑ If the victim does not begin to breathe, administer artificial respiration until the victim begins to breathe on his/her own.
   - ❑ Do not contaminate yourself, especially if the victim has pesticide or vomit around his face or mouth. Use a face shield airway with a one way valve. Do not breathe the exhaled air from the victim.
   - ❑ Perform CPR if the victim's pulse disappears. You should only perform CPR if you are trained to do so.

   If the victim is breathing, but unconscious:
   - ❑ Place the victim in the recovery position (on the side with the head turned slightly to one side). If the victim vomits, try to keep the airway clear.

3. Stop the exposure to the pesticide. Move the victim away from the contaminated area. Remove all contaminated clothing. Use soap and water to wash any skin exposed to the pesticide.

4. Check the Four Basic Facts
   - ❑ **Identify the pesticide**. Look for the label, container or leftover pesticide.
   - ❑ **Quantity** — How much product was the victim exposed to?
   - ❑ **Route of entry** — How did the pesticide enter the body? Did it enter through the mouth, skin/eyes or lungs?
   - ❑ **Time period** — How much time has passed since the victim was exposed to the pesticide, and how long was the exposure? Were the symptoms immediate or did the poisoning occur as a result of using the pesticide over a longer period of time?

Don't waste time. If you can't answer these questions quickly, be ready to tell emergency personnel whatever you can.

5. Call an ambulance or the Poison Information Centre.

6. Start the First Aid treatment appropriate for the route of entry.

7. **Make sure the patient gets medical attention.** First aid is not a substitute for professional medical help.

If your clothes get wet with a pesticide, remove them — immediately

8. If symptoms of illness occur during or shortly after handling a pesticide, go to a hospital. Take your list of common-name chemicals with you. (See Emergency Procedures for Pesticide Poisoning on the inside back cover.)

9. Clean up any pesticide spills immediately. In the case of minor spills, use dry soil or other absorbent material such as kitty litter to remove excess liquid. Sweep up powders and granulars. Spread contaminated soil and sweepings over a large area of bare soil to facilitate rapid degradation. Make sure you are adequately protected when cleaning up a spill. For information on preventing spills see OMAFRA Factsheet, *Ways to Avoid Pesticide Spills*, Order No. 96-025. (See inside front cover for information on how to obtain factsheets.)

If a pesticide spill causes, or is likely to cause, an adverse effect, you must notify the Ministry of Environment, Spills Action Centre at: 1-800-268-6060 (24 hrs/day, 7 days/week) and the municipality.

10. If a well becomes contaminated, follow the clean-up instructions in OMAFRA Factsheet, *Pesticide Contamination of Farm Water Supplies*, Order No. 00-099.

Emergency Procedures for Pesticide Poisoning And First-aid Information (See Inside Back Cover)

Relative Toxicity to Applicator

Definitions

Lethal Dose 50% (LD_{50})
The dose that, when administered, will kill 50% of the test animals within a stated period.

Acute Toxicity
Immediate adverse effects from a single or short period of exposure to a substance by the oral, dermal, or inhalation route.

High Acute Toxicity
These pesticides are extremely dangerous if handled carelessly. The acute oral LD_{50} is less than 50 mg/kg of body weight, and the acute dermal LD_{50} is less than 200 mg/kg body weight.

- These pesticides can be fatal if you take less than 0.1 to 3.0 mL (1 drop to half a teaspoon).
- These pesticides are labeled with the skull and crossbones in a stop sign.
- You must use a respirator and eye protection along with all other protective clothing when using these products.

Common (active) name	Trade name
azinphos methyl	Guthion, Sniper
carbofuran	Furadan
disulfoton	Di-Syston
endosulfan	Endosulfan, Thiodan
fonofos	Dyfonate II
methomyl	Lannate
permethrin	Ambush
phorate	Thimet
terbufos	Counter

Moderate Acute Toxicity
These pesticides are dangerous if handled carelessly. The acute oral LD_{50} is 50–500 mg/kg of body weight, and the acute dermal LD_{50} is 200–2,000 mg/kg body weight.

- These pesticides can be fatal if you take 3–30 mL (half a teaspoon to 2 tablespoons).
- These pesticides are labeled with the skull and crossbones on a stop sign.
- Wear a respirator when handling these concentrates.

Common (active) name	Trade name
chlorpyrifos	Lorsban, Pyrinex, Pyrifos
cyhalothrin-lambda	Matador
cypermethrin	Ripcord
deltamethrin	Decis
dimethoate	Cygon, Lagon
phosmet	Imidan
tefluthrin	Force

Low Acute Toxicity
These pesticides are not fatal unless deliberately ingested in amounts of over 30 mL (1 oz.). The acute oral LD_{50} is greater than 500 mg/kg body weight, and the acute dermal LD_{50} is greater than 2,000 mg/kg body weight. Pesticides listed in this publication and not in the prior lists found above have low acute toxicities.

- Handle these pesticides with caution.
- You must wear protective clothing.
- Wear safety goggles, and if using these products in a confined space, use a respirator.

Chronic Toxicity

It is not possible to assess chronic toxicity of a pesticide in the same way an LD_{50} is used to determine acute toxicity. Instead, a number of tests performed on animals help predict whether a pesticide may cause long-term effects. Animals are examined for a variety of toxic effects such as the production of tumors or abnormalities. Use protective clothing and equipment to help reduce exposure and the risk of chronic effects.

Entering Treated Areas

Workers may be poisoned if they enter fields without wearing protective equipment too soon after pesticides have been applied. Such poisoning can result from handling treated plants or from inhaling pesticide vapours. The list below shows a specific minimum interval that you must observe between applying the pesticide and working in the treated crop without protective equipment.

- Some pesticides, like parathion, have labels that carry a warning about working in treated crops. Follow the label recommendations.
- Otherwise, keep to the following minimum inter vals:

Pesticide	Interval
azinphos-methyl (Guthion, Sniper)	48 hours
carbofuran (Furadan)[1]	48 hours
methomyl (Lannate)	24 hours

[1] If prolonged direct contact with corn foliage will occur, do not enter treated fields within 14 days of application without wearing protective equipment.

Blood Tests for Those Applying Pesticides

Organophosphorus and *carbamate* pesticides can affect a person's serum and red blood cholinesterase levels. If cholinesterase activity falls below a critical level, poisoning can result. Symptoms include fatigue, dizziness, nausea, trembling, blurred vision and difficulty breathing.

If you use any of the groups of pesticides listed below, have your family doctor check your cholinesterase levels. To be of value, start the tests before you use these pesticides, since the normal level variety considerably, making it difficult to assess the degree of suppression. In this publication, the insecticides of primary concern are listed below.

Protective Outdoor Clothing

Why Use Personal Protection?

Pesticide formulations vary in toxicity from slightly to extremely poisonous. Exposure occurs once the pesticide is removed from the container. The toxicity of the pesticide and exposure to the user create a hazard.

Common (active) name	Trade name
azinphos-methyl	Guthion, Sniper
carbaryl	Sevin
carbofuran	Furadan
chlorpyrifos	Lorsban, Pyrinex, Pyrifos
dimethoate	Cygon, Lagon
disulfoton	Di-Syston
fonofos	Dyfonate II
malathion	Malathion
methomyl	Lannate
phosmet	Imidan
phorate	Thimet
terbufos	Counter
trichlorfon	Dylox

Both can be reduced — toxicity by dilution and exposure by protective clothing. Wearing protective clothing reduces the hazards of spraying and thus the risk of poisoning.

Stage	Risk
Handling and mixing concentrate	very high
Rinsing empty containers	high
Applying outdoors	low–high
Applying indoors	medium–very high
Cleaning up, rinsing equipment	medium–high
Entering treated area within 48 hours	low–very high

Reducing Exposure

Exposure to pesticides can be through skin, eyes, mouth or nose. In most spray operations, about 80%–85% of the exposure occurs during mixing and loading of the product concentrate. Field application usually accounts for 15%–20% of the exposure. Skin exposure is usually 90%–100% of the total exposure. Around 70% of this is by way of the hands and forearms and 30% involves the rest of the body. Inhalation (nose and mouth) exposure is normally 0.1% but rises to 5%–10% with mist blowers and air blast sprayers, and where product formulations are fine powders.

Protective clothing

- To reduce skin (dermal) exposure, wear impervious gloves. Always refer to the product label. Unless the label states otherwise, use neoprene or nitrile gloves. Always wear waterproof boots, along with coveralls, apron or spray suits and a waterproof cap.
- Coveralls can be reusable or disposable. Reusable coveralls are normally cotton or polyester and should be tightly woven. It's easier for the pesticides to penetrate polyester than cotton. Thoroughly launder reusable coveralls in laundry loads separate from normal clothing.
- Use spray suits in highly hazardous conditions such as with mist blowers and air blast machines.
- Protect your eyes with safety goggles when working with any pesticide concentrate.

Respirators

- Use respirators when handling pesticides with labels that call for respiratory protection and carry the warning stop sign with skull and crossbones.
- Use respirators when spraying any pesticide rated as high toxicity or when applying any liquefied gas.
- Respirators are available as air purifiers or self-contained units and come in a wide range of shapes and sizes. Consult the label and your nearest safety supply company for advice.
- Ensure that you purchase National Institute for Occupational Safety and Health (NIOSH) — approved respirators, pesticide cartridges and prefilters.

Washing protective clothing

- Clean your protective clothing and equipment thoroughly.
- Never let children or pets come in contact with contaminated clothing or equipment.
- Launder clothing promptly. Wash and store all personal protection items in a clean safe place.
- Rinse spray equipment and store it away to prevent children playing with it.

Fabric clothing

- If fabric is saturated with the concentrate of a highly toxic pesticide, throw it out.
- Wear nitrile or neoprene gloves when handling severely contaminated clothing.
- Remove the clothing carefully and immediately put it in a plastic bag and dispose of it in a safe manner.
- For a normal spray operation, follow these guidelines, preferably twice a day, but at least at the end of the work day:
  - ❑ rinse clothing outdoors
  - ❑ soak and wash protective clothing separately from other clothes
  - ❑ soak protective clothing with detergent, in a container such as a large bucket or tub; or use the pre-wash cycle of an automatic washer, with detergent. Solvent-based, pre-wash products work on EC pesticide formulations
  - ❑ wash only a few garments at a time
  - ❑ use heavy-duty liquid detergents
  - ❑ use hot water, the highest water level, and a regular hot super-wash cycle
  - ❑ do 2 complete wash cycles, each with a double rinse
  - ❑ after washing, run another wash cycle with detergent and no clothing, to decontaminate the washing machine
  - ❑ hang the clothes to dry, outside if possible, to avoid a potential build-up of pesticide residue in the dryer

Rubber, Vinyl, or Plastic Boots and Gloves

- To avoid getting pesticide on your hands, wash the outside of your boots and gloves with detergent and water before taking them off.
- After removing boots and gloves, wash them inside and out with detergent and water, rinse thoroughly, and dry in a well-ventilated area.

Chemical-Resistant Clothing, Goggles and Face Mask

- Wash plastic or rubber clothing and equipment with detergent and water, rinse thoroughly, and dry in a well-ventilated area.

Respirators

- Discard cartridges, canisters and filter pads when breathing becomes difficult, when you notice a pesticide odour, or at the interval set by the manufacturer.
- Make a note of the date the cartridge is first used.
- Remove cartridges and filter pads from the face piece and store in clean, sealed plastic bags.
- Wash the face piece in detergent and water, rinse thoroughly, and dry in a well-ventilated area.
- Never use alcohol or other solvents for cleaning, as they will damage the rubber and plastic.

Consult the safety supply house of your choice for help in selecting your protective clothing. (See *Table 1-1, Safety Supply Companies in Ontario,* page 7.)

Protective Devices for Use in Enclosed Areas

Canister Gas Masks

- Canister gas masks protect against certain harmful gases, vapours and particulate matter. They are generally suitable for ventilated areas not subject to rapid change.
- Do not use in confined spaces where oxygen deficiency and high gas concentrations may occur.

Self-Contained Breathing Apparatus

- Air purifying apparatuses do not work in confined spaces where gas concentrations are unusually high. The lack of oxygen can prove fatal. Under these conditions, you need an air supply provided by a self-contained breathing apparatus (e.g., Scott Air Pack).
- Using substances that produce hydrogen cyanide, methyl bromide, chloropicrin, or phosphine can produce high gas concentrations and oxygen deficiency as can smoke generators, foggers using highly toxic pesticides, and some volatile sprays. Under these situations, you need an air supply provided by a self-contained breathing apparatus (e.g., Scott Air Pack)

Other Protective Clothing

- Wear other protective clothing in keeping with requirements listed on the pesticide label.

Working Conditions

- Use canister gas masks when the surrounding air contains low concentrations of toxic gases, vapours or particulate matter derived from soil-drench, granular, dust, or foliar spray applications. Pesticides applied in this manner usually have moderate to low toxicity.
- You must use a self-contained breathing apparatus (e.g., Scott Air Pack) when applying highly toxic pesticides. These can produce high concentrations of toxic gases, vapours or particulate matter, and a lack of oxygen, especially in an enclosed space (e.g., fumigating grain). Contact your safety supply company for their recommendation.

Space Fumigants and Insecticide Smokes

- When using fumigants or insecticide smoke generators, wear protective clothing to prevent skin and inhalation exposure.
- During and after treatment, lock the building and post warning signs.
- Follow instructions on the product label regarding aeration of treated buildings, warehouses, grain storage bins or other areas before letting anyone enter.

Fumigants

- An agriculturalist using methyl bromide plus chloropicrin or aluminum phosphide to fumigate greenhouses, vaults, warehouses and grain storages must obtain a permit issued under Ontario's *Pesticides Act.*
- To apply for a permit, contact the local pesticides officer with the Ontario Ministry of the Environment.
- Remove livestock and poultry that are in the same building.
- As a safety precaution, have someone else who is wearing personal protective equipment help with the fumigation.

TABLE 1–1. Safety Supply Companies in Ontario Providing Protective Clothing & Equipment

3-M Canada Inc.	Occupational Health and Environmental Safety, Box 5757 London, ON N6A 4T1	(519) 452-6165 1-800-364-3577 Fax: (519) 452-4660
Acklands Grainger	90 W. Beaver Creek Rd. Richmond Hill, ON L4B 1E7	(905) 731-5516 1-800-668-8989 Fax: (905) 731-2798
Aearo Canada	7115 Tomken Rd. Mississauga, ON L5S 1X7	(905) 795-0700 1-800-387-4304 Fax: (905) 564-5250
Dutch Industries "Protect-Air Cab Filter"	Huron Tractor, Box 1300 Exeter, ON N0M 1S3	(519) 235-1115 Fax: (519) 255-1939
HAMISCO	3392 Wonderland Rd. London, ON N6L 1A8	(519) 652-9800 1-800-668-9800 Fax: (519) 652-9661
Kappler Canada	Box 1687 20 Ryan Place Brantford, ON N3T 5V7	(519) 752-4369 1-800-387-9326 Fax: (519) 752-2161
Levitt-Safety (Eastern) Limited	2872 Bristol Circle Oakville, ON L6H 5T5	(905) 829-3299 1-800-668-6153 Fax: (905) 829-2919
MSA Canada Inc.	148 Norfinch Dr. North York, ON M3N 1X8	(416) 667-9400 1-800-267-0672 Fax: (416) 663-5908
Mitt & Robe Co.	751 Norfolk St. N. Simcoe, ON N3Y 3R6	(519) 428-4050 1-877-893-6565 Fax: (519) 428-5142
Plant Products Co. Ltd.	314 Orenda Road Brampton, ON L6T 1G1	(905) 793-7000 1-800-387-2449 Fax: (905) 793-9632
Safety Express	4060B Sladeview Cresc., Unit 2 Mississauga, ON L5L 5Y5	(905) 608-0111 1-800-465-3898 Fax: (905) 608-0091
The Saint George Company (Suppliers of Kasco Helmets)	P.O. Box 430 20 Consolidated Drive Paris, ON N3L 3T5	(519) 442-2046 1-800-461-4299 Fax: (519) 442-7191

Learn about the health hazards and toxic properties of the pesticide you're using. Consult the product label, Material Safety Data Sheets (MSDS), or manufacturer for this information. Check the company Web sites for MSDS information.

- Always consult the product label.
- When handling methyl bromide, do not wear gloves because these will trap gas next to the skin. You must wear a full-face respirator with organic vapour canister or positive pressure breathing apparatus.
- When handling aluminum phosphide, use cotton gloves and wear a full-face mask respirator with an acid gas canister.
- For more information, obtain *Methyl Bromide Structure Fumigation Procedures* and *Aluminum Phosphide Structure Fumigation Procedures* from the Ontario Ministry of the Environment.

Storing Pesticides

- Ontario's *Pesticides Act* and Regulation 914 require that all pesticides be kept out of the reach of children, irresponsible persons, pets and livestock.
- Store pesticides in a locked facility away from food and feed.
- Store herbicides separately from other pesticides to avoid contamination.
- Always store pesticides in their original containers and keep them tightly closed.
- Never put pesticides in unmarked containers.
- In areas where flooding has been frequent, you must store fertilizers and pesticides above the known high-water mark. Contamination of water by these chemicals has led to serious health problems for humans and domestic animals as well as fish and wildlife.
- See also OMAFRA Factsheet, *Pesticide Handling Facilities*, Order No. 94-037.

Schedule 1, 2 and 5 pesticides

- Schedule 1, 2 and 5 pesticides must be stored in a locked facility that is ventilated to the outside.
- A sign that says "CHEMICAL STORAGE WARNING— AUTHORIZED PERSONNEL ONLY" in block capitals must be affixed to the outside of each entrance.
- Only the certified agriculturalist or someone under that person's supervision can enter the storage facility.

Disposal of Pesticide Containers or Contaminated Material

- Either burn or dispose at a landfill site all paper or cardboard pesticide containers, paper packaging material or other paper material used to clean up spills.
- Keep people and animals away from the smoke and ensure the smoke is not directed toward buildings, highways, roads or outdoor public areas.
- Do not burn plastic material.
- Unrinsed containers can contain as much as 3% of the original formulation. If this amount of toxic pesticide is discarded with the container it could be dangerous to people or the environment (for example, your water supply). Failure to rinse containers is also wasteful. Use that 3% for the reason you bought it — to control the pest!
- Rinse all metal, plastic or glass containers three times with water and add the washings to the spray tank. Rinsing devices can be used to puncture the bottom of a metal or plastic container and rinse the residue directly into the spray tank. This procedure takes less than a minute. Return the rinsed containers for recycling to any dealer co-operating in the pesticide container collection and recycling program.
- To dispose of unwanted or contaminated pesticide product:
  - ❑ Contact your local supplier. It is sometimes possible to return unused pesticide if it is still in its original container.
  - ❑ The Ministry of the Environment has an agreement with Safety-Kleen for the disposal of unwanted pesticides on a user-paid basis. Contact Safety-Kleen in London, Ontario at (519) 451-6630 for disposal of unwanted or contaminated pesticides.

- ❑ Contact a licensed waste hauler (licensed under the *Environmental Protection Act* (EPA) to carry hazardous waste) to arrange for disposal of your unwanted or contaminated pesticide. Please check your local yellow pages under Liquid Waste Removal, or Waste Management to arrange for proper disposal, or consult the local Ontario Ministry of the Environment office for additional information. Watch your local paper or trade publication for obsolete farm pesticides collection and disposal programs, or contact your dealer for further information. On these days, you can turn over surplus or unwanted pesticide concentrates (maximum 25L) for disposal at no cost.

Soluble Packaging Available

To simplify disposal of empty pesticide packages, the industry re-introduced a soluble package that dissolves in the tank of the farm sprayer. Water-soluble packaging under the names such as — Clean Pak, Solupak, and Toss-N-Go is used for dry flowable and wettable powder formulations of pesticides.

In most cases, the water-soluble packaging material is PVA (poly vinyl alcohol). This material dissolves completely when added to the water in the sprayer tank according to instructions.

Handling

- Always wear gloves when handling pouches.
- Do not allow water-soluble pouches to become wet prior to adding them to the sprayer tank.
- Do not handle the pouches with wet hands or wet gloves.
- Do not remove water-soluble pouches from the overwrap (outer package) except when adding to the sprayer tank.
- Always reseal the overwrap (outer package) to protect the remaining pouches from moisture.

Mixing

- After the spray tank is ¼ full of water and the agitator is running, add the water-soluble pouches to the tank.
- Depending on the water temperature and the degree of agitation, these pouches dissolve completely within 5 min.
- As the tank continues to fill, add any other compatible pesticides.
- Consult product labels for specific mixing instructions for each product.

Compatibility

- Do not add a pesticide that is incompatible with the PVA packaging material. The PVA material is not soluble with summer-type oils (e.g., Superior Oil).
- Do not combine with the pouches any material containing boron (e.g., Solubor), chelated micronutrients or water-soluble fertilizers. The combination is likely to cause a sticky, insoluble substance in the tank.
- After applying boron, chelated micronutrients or water-soluble fertilizers, completely empty and rinse the spray tank before using any product packaged in PVA.

Read all labels and instructions carefully. For more details contact your farm chemical dealer.

Sprayers

- Herbicide sprayers that can deliver enough litres per hectare for adequate coverage are satisfactory for applying emulsion-type insecticides.
- If 2,4-D or related herbicides are used, clean the sprayers thoroughly with detergent containing ammonia to prevent crop damage.
- Adequate agitation is essential when applying wettable powder formulations.
- Pumps should be capable of delivering the flow and pressure required as well as being compatible with materials sprayed.
- Keep in mind that the higher the pressure, the greater the danger of drift to other crops.
- Calibrate your sprayer at least twice during the growing season with each set of nozzles used. The wear on nozzles and other parts will alter the amount of spray delivered.
- Check all nozzles for flow rate at least once a year. Replace nozzles when their output is 10% greater than rated output.

- For information on calibration, see the current OMAFRA Publication 75, *Guide to Weed Control.* See calibration calculator on the OMAFRA web site.

Band Spraying of Insecticides

- When banding insecticides, apply the recommended rate over the strip of row you wish to treat.
- While banding does not use a more concentrated spray mixture, it does allow you to cover more area with the same amount used for a broadcast application. For example, if you are treating only 1/3rd of the row width, you will be able to cover 3 times the area compared to a broadcast application.

Application by Airplane or Helicopter

- Aerial applicators must obtain a Commercial Aerial Applicators license from the Ontario Ministry of the Environment to apply pesticides. They also need permits from the Ontario Ministry of the Environment to apply Schedule 1 and 5 pesticides and Schedule 2 hormone-type herbicides.
- Ministry personnel will inspect the area to ensure the application is done safely.
- It is an offence under the federal *Pest Control Product Act* and the provincial *Pesticides Act* to use a control product under unsafe conditions.
- Follow precautions at all times to prevent drift.
- Take extra precautions when using insecticides applied by air, especially those known to be toxic to honeybees, such as Sevin (carbaryl).
- Do not make applications if the wind is blowing (>10 km/hr). Even on the calmest day, some drift occurs.
- To keep pesticide drift to a minimum, make applications in the evening or early morning.
- Be sure that the contract specifies the product to be used and its rate of application. Aircraft may apply only products specifically allowing aerial use as outlined on the label.

Pesticide Drift

- Pesticide drift can leave residues on adjacent crops, be a hazard to nearby people and livestock, and reduce the amount of material in the target area so that it is ineffective.
- If applying pesticides make every effort to minimize or prevent pesticide spray drift by doing one or more of the following:
  - ❑ read the product label
  - ❑ being aware of the toxicity of the pesticide being used
  - ❑ use buffer strips around water courses and neighbouring fields
  - ❑ select the correct water volume rate
  - ❑ use proper nozzle selection and where practical, adopt use of air induction/venturi nozzles that significantly reduce drift compared to conventional nozzles
  - ❑ be aware of the weather conditions, including wind speed and direction
  - ❑ use spray plume protection where practical or available (hoods, shrouds, screens and air curtains)
  - ❑ use drift reducing adjuvants
  - ❑ utilize wick weeders
  - ❑ select the correct nozzle-to-target distance
  - ❑ don't spray if conditions are not suitable
- Do not spray with conventional equipment during wind speeds greater than 10 km/hr if you have selected a low volume fine mist spray output.
- It may be tolerable to spray in winds up to 20 km/hr if the spray droplets are mostly large, and if there are adequate buffer zones around sensitive and residential areas to prevent off-site damage, and if best management practices are used to reduce drift.
- Growers are responsible for any material discharged from their sprayers no matter where it is found. This includes liability for adverse affects such as damage to crops or to ornamental plants, and illegal or unacceptable residue on neighbours' crops or property. You could also be responsible for injury resulting from car accidents caused by windows smeared by spray drift or allergic or asthmatic reactions of bystanders even if they are not on your property.
- Take all precautions necessary to prevent drift from the target site that might implicate you in any damaging action.
- For more information consult OMAFRA Factsheet, *Reducing Pesticide Drift and Crop Damage,* Order No. 00-103, OMAFRA/Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application* and the Ridgetown College video *How to Manage Spray Drift.*

Residues on Crops to be Harvested, Fed or Grazed

- Some pesticide residues disappear quickly while others persist in poisonous concentrations.
- When crops with persistent residues are fed to livestock, the poisons may accumulate in the body fat, and milking cows will excrete them or their metabolic products in the milk. Young calves, heifers, and dry cows can store them in body fat and secrete them when they freshen months later.
- Do not use crop residues treated with Thiodan or Endosulfan for bedding.

To avoid exceeding the residue tolerance for insecticides, herbicides and fungicides:

Do not apply products beyond their preharvest interval as stated on the product label.

Apply only those products registered for the intended crop and pest.

Do not apply more than the recommended amount.

Do not apply products more often than recommended on the label.

- As an example, when controlling insects do not apply an insecticide later than the recommended number of days from harvest. For instance, Malathion 500 EC 2– 2.75 L (7 days) indicates that the malathion spray should not be used later than 7 days before the beginning of harvest and that no more than 2.75 L of an emulsifiable concentrate formulation containing 50% malathion should be used for 1 ha of crop in an application.

Bee Poisoning

- Honeybees, as well as other bees and insects, are important pollinators of crops. Many crops are important sources of pollen for honey. It is therefore important to refrain from poisoning bees foraging on these crops.
- Insecticides are required for insect control. With careful management, you can get good insect control without killing bees. The following are a few points to remember in preventing bee poisoning.
  - ❑ Do not spray any flowering crop on which bees are foraging. If you must apply insecticides, spray in early morning or evening when bees are not foraging. Bees usually do not forage at temperatures below 13°C.
  - ❑ If you must apply an insecticide poisonous to bees when they are foraging, notify neighbouring beekeepers so they can protect their bees.
  - ❑ Do not apply insecticide on windy days to prevent drift toward any nearby hives.
  - ❑ Remember that ground applications are generally less hazardous than aircraft applications and there is usually less drift.
  - ❑ When there is a choice, choose the formulation less hazardous to bees. Dusts are more toxic than sprays. EC formulations are less toxic than WP formulations.
- When planning to apply a pesticide, advise local beekeepers so that they can move colonies out of the danger area. Contact the Provincial Apiarist at 1-888-466-2372 for a list of beekeepers in your area.
- Most organophosphate and carbamate insecticides are highly toxic to bees. Insecticides used in crop production that are toxic to bees are listed below:

TABLE 1–2. Relative Toxicity of Insecticides to Honeybees

Common (active) name	
Group 1 — Very toxic. Do not apply to flowering crops or weeds	
permethrin	Ambush
diazinon	Basudin
dimethoate	Cygon, Lagon
azinphos-methyl	Guthion, Sniper
carbofuran	Furadan
phosmet	Imidan
methomyl	Lannate
chlorpyrifos	Lorsban, Pyrinex
malathion	Malathion
cypermethrin	Ripcord, Cymbush
carbaryl	Sevin
Group 2 — Apply only during late evenings or early morning.*	
deltamethrin	Decis
triclorfon	Dylox
endosulfan	Endosulfan,Thiodan
Relatively Non-Toxic	
All the fungicides	

* Unusually low temperatures at time of application may cause insecticides to remain toxic up to 20 times longer than during warm weather. High temperatures in the early morning or late evening may extend active foraging by bees.

- Other insecticides listed in this publication can be applied at any time with reasonable safety to bees. Consult individual product labels.

Pesticide Concentration

- Brands of a pesticide from different companies often have different concentrations of the same chemical. If you use one with a concentration different from that listed in this publication, adjust the rate of application so you will be applying the same amount of actual chemical (active ingredient).

Seed Treatments

- Seed dressings or treatments are poisonous to people and livestock.
- Do not inhale the fumes or dust when treating or handling treated seed.
- Wear neoprene or nitrile gloves.
- Wash all residues of these chemicals from your skin after finishing the treatment.
- Chemically treated seed is poisonous.
- Never feed treated seed to livestock.
- Destroy all the bags that have held treated seed as recommended in the container disposal section on page 8.

See Table 1-3, Seed Treatments, on page 13, for more information.

Pesticide Certification for Ontario Farmers

- Regulation 914 of the *Pesticides Act* makes it mandatory for farmers to be certified through the Grower Pesticide Safety Course to buy and use Schedules 1, 2 or 5 pesticides on land they farm.
- There must be at least one Certified Grower for each farm operation.
- Under the *Pesticides Act*, you are a grower (farmer) if you:
  - ❑ currently use farm land for agricultural or forestry production and
  - ❑ that farmland is classified as farmland property under Section 7 of the *Ontario Assessment Act*.

Training for Assistants Using Schedule 2 or 5 Pesticides

- As of January 2000, all assistants must have formal pesticide safety training, recognized by the Ministry of the Environment, before they can handle or use Schedule 2 or 5 pesticides under the supervision of a Certified Grower.
- This applies to all assistants, including family members, farm employees and seasonal workers.
- Trained Assistants do not have to write an exam.
- Trained Assistants must be 16 years of age or older.
- There are two training options for assistants. Assistants can:
  - ❑ attend a Grower Pesticide Safety Course and not write the certification examination, or
  - ❑ attend an on-farm training session presented by a qualified Trained Assistant Instructor.
- For more information and a listing of courses and exam-only session dates and locations, check the Ontario Pesticide Education Program web site at www.ridgetownc.uoguelph.ca/opep/.
- To register for a Grower Pesticide Safety Course or GPSC Exam-Only Session (if you are renewing your certificate) or for information about Trained Assistants anywhere in Ontario please:
  - ❑ call 1-800-652-8573 or 519-674-1580, or
  - ❑ fax 1-519-674-1589, or
  - ❑ e-mail: opep@ridgetownc.uoguelph.ca

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TABLE 1–3. Seed Treatments

TRADE NAME	Active Ingredient	Formulation	Crops	Manufacturer	Ontario Schedule[1]
Fungicides					
Anchor	carbathiin + thiram	F (DB)	soybeans	Gustafson Partnership	3
Apron Fl	metalaxyl	F	soybeans, forages, corn, cereals, canola	Gustafson Partnership	3
Apron XL LS	metalaxyl-M	LS	soybeans, corn, canola, wheat, forages, beans	Novartis Crop Protection	2
Baytan 30	triadimenol	F	wheat, barley	Gustafson Partnership	3
Captan FL	captan	F	beans, corn, soybeans	Norac Concepts Inc.	2
Dividend XL	difenoconazole + metalaxyl-M	F	wheat	Novartis Crop Protection	2
Dividend XL RTA	difenoconazole + metalaxyl-M	F	wheat	Novartis Crop Protection	2
Maxim 480FS	fludioxonil	F	corn	Novartis Crop Protection	2
Raxil FL	tebuconazole	F	wheat, barley	Gustafson Partnership	2
Thiram 75 WP	thiram	P	alfalfa	Gustafson Partnership	2
Vitaflo – 280	carbathiin + thiram	F	barley, wheat, oats, flax, dry common beans, soybeans, rye, corn	Gustafson Partnership	3
Vitavax 7 RS	carbathiin + thiram	F	canola, mustard, rapeseed	Gustafson Partnership	2
Insecticides					
Gaucho 480 FL	imidacloprid	F	canola, seed corn only	Gustafson Partnership	5
Fungicides With Insecticides					
Agrox B-3	diazinon + lindane + captan	P (DB)	corn, beans, soybeans	Norac Concepts Inc.	2
Agrox D-L Plus	diazinon + lindane + captan	P (DB)	corn, beans, soybeans	Norac Concepts Inc.	2
D.L.+ C.	diazinon + lindane + captan	P (DB)	corn, beans, soybeans	United Agri Products	2
DCT	diazinon + captan + thiophanate-methyl	P (DB)	dry common beans	Norac Concepts Inc.	3
Vitaflo Dual Purpose	carbathiin + thiram + lindane	F	wheat, barley	Gustafson Partnership	2
Vitavax RS Flowable	carbathiin + thiram + lindane	P (DB)	canola	Gustafson Partnership	2

DB = Drill Box Application EC = Emulsifiable Concentrate F = Flowable LS = Liquid Suspension P = Powder

[1] The numbers identify the Schedules in which the TRADE NAME products listed in this table are classified under the *Pesticide Act*. See Appendix C, Ontario Classification Schedules, on page 59 for an explanation of schedules.

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Fungicides					
Anchor	carbathiin + thiram	F (DB)	soybeans	Gustafson Partnership	3
Apron Fl	metalaxyl	F	soybeans, forages, corn, cereals, canola	Gustafson Partnership	3
Apron XL LS	metalaxyl-M	LS	soybeans, corn, canola, wheat, forages, beans	Novartis Crop Protection	2
Baytan 30	triadimenol	F	wheat, barley	Gustafson Partnership	3
Captan FL	captan	F	beans, corn, soybeans	Norac Concepts Inc.	2
Dividend XL	difenoconazole + metalaxyl-M	F	wheat	Novartis Crop Protection	2
Dividend XL RTA	difenoconazole + metalaxyl-M	F	wheat	Novartis Crop Protection	2
Maxim 480FS	fludioxonil	F	corn	Novartis Crop Protection	2
Raxil FL	tebuconazole	F	wheat, barley	Gustafson Partnership	2
Thiram 75 WP	thiram	P	alfalfa	Gustafson Partnership	2
Vitaflo – 280	carbathiin + thiram	F	barley, wheat, oats, flax, dry common beans, soybeans, rye, corn	Gustafson Partnership	3
Vitavax 7 RS	carbathiin + thiram	F	canola, mustard, rapeseed	Gustafson Partnership	2
Insecticides					
Gaucho 480 FL	imidacloprid	F	canola, seed corn only	Gustafson Partnership	5
Fungicides With Insecticides					
Agrox B-3	diazinon + lindane + captan	P (DB)	corn, beans, soybeans	Norac Concepts Inc.	2
Agrox D-L Plus	diazinon + lindane + captan	P (DB)	corn, beans, soybeans	Norac Concepts Inc.	2
D.L.+ C.	diazinon + lindane + captan	P (DB)	corn, beans, soybeans	United Agri Products	2
DCT	diazinon + captan + thiophanate-methyl	P (DB)	dry common beans	Norac Concepts Inc.	3
Vitaflo Dual Purpose	carbathiin + thiram + lindane	F	wheat, barley	Gustafson Partnership	2
Vitavax RS Flowable	carbathiin + thiram + lindane	P (DB)	canola	Gustafson Partnership	2

DB = Drill Box Application EC = Emulsifiable Concentrate F = Flowable LS = Liquid Suspension P = Powder

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TABLE 1–4. Fungicides

TRADE NAME	active ingredient	Fungicide Classification	Days to Harvest	Relative Toxicities	Aerial Application	Manufacturer	Use and Remarks	Ontario Sch.[1]
Benlate 50 WP Benlate Toss-N-Go WP	benomyl	benzimidazole	14 14	Low	Yes	Dupont	field beans canola	3
Botran 75 W	dichloran	nitroaniline	2	Low	Yes	United Agri Products	field beans	3
Dithane DG Rainshield	mancozeb	dithiocarbamate	40	Low	Yes	Rohm and Haas	spring and winter wheat, alfalfa	3
Folicur 432F	tebuconazole	conazole	30	Low	Yes	Bayer	wheat	2
Quadris	azoxystrobin	stobilurin	30	Low	Yes	Zeneca Agro	canola	2
Ronilan EG	vinclozolin	dicarboximide	45 40	Low	Yes	BASF	dry edible beans, canola	3
Rovral WP	iprodione	dicarboximide	14 —	Low	Yes	Aventis	field beans canola	3
Senator 70 WP	thiophanate-methyl	benzimidazole	14	Low	Yes	Engage Agro	white beans	3
Tilt 250E	propiconazole	triazole	14 corn, 45 cereals, 60 canola	Low	Yes	Novartis Crop Protection	wheat, oats, barley, corn, canola, soybeans (for seed only)	2

E = Emulsifiable Concentrate EG = Extruded Granular F = Flowable WP = Wettable Powder

[1] The numbers identify the Schedules in which the TRADE NAME products listed in this table are classified under the *Pesticide Act*. See Appendix C, Ontario Classification Schedules, on page 59 for an explanation of schedules

TABLE 1–5. Insecticides

TRADE NAME	active ingredient	Insecticide Classification	Days to Harvest	Relative Toxicities	Aerial Application	Manufacturer	Use and Remarks	Ontario Sch.[1]
Counter 15G, 5G	terbufos	organo- phosphorus	Planting time only	High	No	BASF	corn, canola, mustard	5
Cygon 4 E	dimethoate	organo- phosphorus	2 alfalfa 7 beans	Moderate	Yes	Inter- Provincial Co-operatives Organization	alfalfa, field beans, soybeans Toxic to bees.	2
Cymbush 250 EC	cypermethrin	pyrethroid	30 canola 5 corn	Moderate	No	Zeneca Agro	corn, canola Toxic to bees.	2
Decis 5.0 EC	deltamethrin	pyrethroid	14 canola 1 corn	Moderate	Yes	Aventis	canola, corn Toxic to bees.	2
Dipel 2X DF	*Bacillus thuringiensis*	bacterial toxin	0	Low	Yes	Valent	timothy	3
Dylox 420 Liquid	trichlorfon	organo-phosphorus	21 cereals canola	Low	Yes	Bayer	canola, alfalfa, corn, cereals Relatively safe to bees.	3
Force 3G	tefluthrin	pyrethroid	Planting time only	Moderate	No	Zeneca Agro	corn	2
Furadan 480F	carbofuran	carbamate	60 canola	High	Yes	Bayer	canola Toxic to bees.	5
Guthion 240 SC Guthion Solupak 50 WP	azinphos-methyl	organo-phosphorus	21 alfalfa, clover 30 rye	High	Yes	Bayer	alfalfa, clover, rye Toxic to bees.	5
Imidan 50 WP	phosmet	organo-phosphorus	7	Moderate	Yes	Gowan Company	alfalfa Toxic to bees.	3
Lagon 480 EC	dimethoate	organo-phosphorus	7 beans, 28 alfalfa, 21 canola, 2 cereal	Moderate	Yes	United Agri Products	soybeans, beans, canola, alfalfa, cereals Toxic to bees.	2
Lannate Toss-N-Go 90 SP	methomyl	carbamate	20 cereals 8 canola	High	Yes	Dupont	cereals, canola Toxic to bees.	2
Lorsban 4 E, 15 G	chlorpyrifos	organo-phosphorus	70 corn, 21 canola 60 wheat	Moderate	Yes	Dow AgroSciences	corn, cereals, canola Toxic to bees	2, 3
Malathion 500 EC	malathion	organo-phosphorus	7 alfalfa, cereals, corn, 3 beans	Low	Yes	UCO, United Agri Products	alfalfa, cereals, field beans, soybeans, corn. Toxic to bees. Less effective below 20°C.	3

E = Emulsifiable Concentrate EG = Extruded Granular F = Flowable WP = Wettable Powder

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Benlate 50 WP Benlate Toss-N-Go WP	benomyl	benzimidazole	14 14	Low	Yes	Dupont	field beans canola	3
Botran 75 W	dichloran	nitroaniline	2	Low	Yes	United Agri Products	field beans	3
Dithane DG Rainshield	mancozeb	dithiocarbamate	40	Low	Yes	Rohm and Haas	spring and winter wheat, alfalfa	3
Folicur 432F	tebuconazole	conazole	30	Low	Yes	Bayer	wheat	2
Quadris	azoxystrobin	stobilurin	30	Low	Yes	Zeneca Agro	canola	2
Ronilan EG	vinclozolin	dicarboximide	45 40	Low	Yes	BASF	dry edible beans, canola	3
Rovral WP	iprodione	dicarboximide	14 —	Low	Yes	Aventis	field beans canola	3
Senator 70 WP	thiophanate-methyl	benzimidazole	14	Low	Yes	Engage Agro	white beans	3
Tilt 250E	propiconazole	triazole	14 corn, 45 cereals, 60 canola	Low	Yes	Novartis Crop Protection	wheat, oats, barley, corn, canola, soybeans (for seed only)	2

E = Emulsifiable Concentrate EG = Extruded Granular F = Flowable WP = Wettable Powder

[1] The numbers identify the Schedules in which the TRADE NAME products listed in this table are classified under the *Pesticide Act*. See Appendix C, Ontario Classification Schedules, on page 59 for an explanation of schedules

TABLE 1–5. Insecticides

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Counter 15G, 5G	terbufos	organo- phosphorus	Planting time only	High	No	BASF	corn, canola, mustard	5
Cygon 4 E	dimethoate	organo- phosphorus	2 alfalfa 7 beans	Moderate	Yes	Inter- Provincial Co-operatives Organization	alfalfa, field beans, soybeans Toxic to bees.	2
Cymbush 250 EC	cypermethrin	pyrethroid	30 canola 5 corn	Moderate	No	Zeneca Agro	corn, canola Toxic to bees.	2
Decis 5.0 EC	deltamethrin	pyrethroid	14 canola 1 corn	Moderate	Yes	Aventis	canola, corn Toxic to bees.	2
Dipel 2X DF	*Bacillus thuringiensis*	bacterial toxin	0	Low	Yes	Valent	timothy	3
Dylox 420 Liquid	trichlorfon	organo-phosphorus	21 cereals canola	Low	Yes	Bayer	canola, alfalfa, corn, cereals Relatively safe to bees.	3
Force 3G	tefluthrin	pyrethroid	Planting time only	Moderate	No	Zeneca Agro	corn	2
Furadan 480F	carbofuran	carbamate	60 canola	High	Yes	Bayer	canola Toxic to bees.	5
Guthion 240 SC Guthion Solupak 50 WP	azinphos-methyl	organo-phosphorus	21 alfalfa, clover 30 rye	High	Yes	Bayer	alfalfa, clover, rye Toxic to bees.	5
Imidan 50 WP	phosmet	organo-phosphorus	7	Moderate	Yes	Gowan Company	alfalfa Toxic to bees.	3
Lagon 480 EC	dimethoate	organo-phosphorus	7 beans, 28 alfalfa, 21 canola, 2 cereal	Moderate	Yes	United Agri Products	soybeans, beans, canola, alfalfa, cereals Toxic to bees.	2
Lannate Toss-N-Go 90 SP	methomyl	carbamate	20 cereals 8 canola	High	Yes	Dupont	cereals, canola Toxic to bees.	2
Lorsban 4 E, 15 G	chlorpyrifos	organo-phosphorus	70 corn, 21 canola 60 wheat	Moderate	Yes	Dow AgroSciences	corn, cereals, canola Toxic to bees	2, 3
Malathion 500 EC	malathion	organo-phosphorus	7 alfalfa, cereals, corn, 3 beans	Low	Yes	UCO, United Agri Products	alfalfa, cereals, field beans, soybeans, corn. Toxic to bees. Less effective below 20°C.	3

E = Emulsifiable Concentrate EG = Extruded Granular F = Flowable WP = Wettable Powder

[1] The numbers identify the Schedules in which the TRADE NAME products listed in this table are classified under the *Pesticide Act*. See Appendix C, Ontario Classification Schedules, on page 59 for an explanation of schedules

TABLE 1–5. Insecticides (Continued)

TRADE NAME	active ingredient	Insecticide Classification	Days to Harvest	Relative Toxicities	Aerial Application	Manufacturer	Use and Remarks	Ontario Sch.[1]
Matador 120 E	cyhalothrin-lambda	pyrethroid	14 corn, 50 canola, 28 wheat	Moderate	Yes	Zeneca Agro	corn, canola, alfalfa, wheat, barley, oats	5
Pounce EC	permethrin	pyrethroid	1 canola	Moderate	Yes	United Agri Products	canola, cereals, corn, flax, sunflowers	3
Pyrifos 15G	chlorpyrifos	organo phosphorus	Planting time only	Moderate	No	United Agri Products	corn	5
Pyrinex 480 EC	chlorpyrifos	organo phosphorus	7 corn, 60 cereals 21 canola	Moderate	Yes	United Agri Products	corn, canola, cereals Toxic to bees.	2
Ripcord 400 EC	cypermethrin	pyrethroid	30 canola wheat 5 corn	Moderate	Yes	BASF	canola, corn, wheat Toxic to bees.	2
Sevin XLR Plus	carbaryl	carbamate	5 beans, 2 alfalfa, 14 oats, wheat 28 barley 1 corn	Moderate	Yes	Aventis	alfalfa, cereals, beans, corn, canola Toxic to bees.	3
Sniper 240 E Sniper 50 W Clean Pak	azinphos-methyl	organo- phosphorus	21 alfalfa, clover, 30 rye	High	Yes,	United Agri Products	alfalfa, clover, rye Toxic to bees.	5
Thimet 15 G	phorate	organo- phosphorus	Planting time only	High	No	BASF	corn	2
Thiodan 4 EC	endosulfan	organo- chlorine	2 beans 50 corn 30 alfalfa, rye	Moderate	Yes	Aventis	field beans, corn, alfalfa, rye Toxic to bees.	2
Thuricide HPC	*Bacillus thuringiensis*	bacterial toxin	0	Low	Yes	Thermo Trilogy	timothy	3

E = Emulsifiable Concentrate EG = Extruded Granular F = Flowable WP = Wettable Powder

[1] The numbers identify the Schedules in which the TRADE NAME products listed in this table are classified under the *Pesticide Act*. See Appendix C, Ontario Classification Schedules, on page 59 for an explanation of schedules

TABLE 1–5. Insecticides (Continued)

TRADE NAME	active ingredient	Insecticide Classification	Days to Harvest	Relative Toxicities	Aerial Application	Manufacturer	Use and Remarks	Ontario Sch.[1]
Matador 120 E	cyhalothrin-lambda	pyrethroid	14 corn, 50 canola, 28 wheat	Moderate	Yes	Zeneca Agro	corn, canola, alfalfa, wheat, barley, oats	5
Pounce EC	permethrin	pyrethroid	1 canola	Moderate	Yes	United Agri Products	canola, cereals, corn, flax, sunflowers	3
Pyrifos 15G	chlorpyrifos	organo phosphorus	Planting time only	Moderate	No	United Agri Products	corn	5
Pyrinex 480 EC	chlorpyrifos	organo phosphorus	7 corn, 60 cereals 21 canola	Moderate	Yes	United Agri Products	corn, canola, cereals Toxic to bees.	2
Ripcord 400 EC	cypermethrin	pyrethroid	30 canola wheat 5 corn	Moderate	Yes	BASF	canola, corn, wheat Toxic to bees.	2
Sevin XLR Plus	carbaryl	carbamate	5 beans, 2 alfalfa, 14 oats, wheat 28 barley 1 corn	Moderate	Yes	Aventis	alfalfa, cereals, beans, corn, canola Toxic to bees.	3
Sniper 240 E Sniper 50 W Clean Pak	azinphos-methyl	organo- phosphorus	21 alfalfa, clover, 30 rye	High	Yes,	United Agri Products	alfalfa, clover, rye Toxic to bees.	5
Thimet 15 G	phorate	organo- phosphorus	Planting time only	High	No	BASF	corn	2
Thiodan 4 EC	endosulfan	organo- chlorine	2 beans 50 corn 30 alfalfa, rye	Moderate	Yes	Aventis	field beans, corn, alfalfa, rye Toxic to bees.	2
Thuricide HPC	*Bacillus thuringiensis*	bacterial toxin	0	Low	Yes	Thermo Trilogy	timothy	3

E = Emulsifiable Concentrate EG = Extruded Granular F = Flowable WP = Wettable Powder

[1] The numbers identify the Schedules in which the TRADE NAME products listed in this table are classified under the *Pesticide Act*. See Appendix C, Ontario Classification Schedules, on page 59 for an explanation of schedules

2. Corn (Field and Seed)

INSECTS

TABLE 2–1. Corn (Field and Sweet) Seed and Soil Applied Insecticide Recommendations

Active Ingredients	Trade Name	Formulation	Corn Insects			
			Corn Rootworms	Wireworms	Seedcorn Maggot	Black Cutworm
Untreated Seed						
diazinon + lindane + captan	Agrox B-3	P (DB)	—	+	+	—
Seed Pretreated With Fungicide						
diazinon + lindane + captan	Agrox D-L Plus	P (DB)	—	+	+	—
diazinon + lindane + captan	DL+C	P (DB)	—	+	+	—
chlorpyrifos	Lorsban 15G	G	+	—	—	—
chlorpyrifos	Pyrifos 15G	G	+	—	—	—
phorate	Thimet 15G	G	+	—	—	—
tefluthrin	Force 3G	G	+	+	+	S
terbufos	Counter 15G	G	+	+	+	—

DB = Drill Box Application G = Granular P = Powder

+ = recommended for insect listed — = NOT recommended S = suppression

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
CORN ROOTWORM				
Soil Applied at Planting Only			**per 100 m (328 ft) row**	
Avoid planting corn on corn. Crop rotation is the best strategy for control. Risk factors include: heavier soil (clay), high beetle populations in corn of previous season, being the latest field planted in the previous season.	tefluthrin	Force 3 G	37.5 g	May be applied in a T-band or in-furrow. For banded applications, place directly over the furrow in a 15 cm band ahead of the press wheel. In-furrow application, place all material directly in the open seed furrow, behind the planter disc openers.
If there is less than 1 beetle per corn plant on average throughout the month of August, then no insecticide is necessary in the following corn crop.	terbufos	Counter 15 G	75 g	Lock and load. May be applied in a T-band or in-furrow. For banded applications, place directly over the furrow in a 15 cm band ahead of the press wheel. In-furrow application, place all material directly in the open seed furrow, behind the planter disc openers.
In furrow application is safer to the applicator and non target animals then T-band application.	chlorpyrifos	Lorsban 15 G Pyrifos 15 G	75 g 75 g	Must be applied in a 10–15 cm band over the row behind the planter shoe, in front of the press wheel. Do not place in direct contact with seed.
	phorate	Thimet 15 G	75 g	Lock and load. Must be applied in a 10–15 cm band over the row behind the planter shoe, in front of the press wheel. Do not place in direct contact with seed.
WIREWORMS				
Seed Treatment			**per 100 kg seed**	
Expect only 60%–70% control using seed treatments. Risk factors include: history of cereal/corn/grassy weeds, sandy soils, history of wireworm problems, coming out of sod.	diazinon + lindane + captan			For all seed treatments use full rate and ensure good coverage of seed.
		Agrox B-3	340 g	Available as 2 kg container and will treat 600 kg of corn seed.
		Agrox D-L Plus	200 g	Available as a 600 g container and will treat 300 kg of corn seed. Use this product only on seed previously treated with captan or thiram.
Threshold is one wireworm per bait trap. For bait trap information, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*.		DL + C	200 g	Use this product only on seed previously treated with captan or thiram.
	imidacloprid	Gaucho 480 FL	520 mL	For seed corn only. Emergency registration only, expires March 2002. Ensure good coverage. For use in commercial seed treaters only.
Soil Applied at Planting Only			**per 100 m (328 ft) row**	
In furrow application is safer to the applicator and non target animals then T-band application.	tefluthrin	Force 3 G	37.5 g	In-furrow only. Place directly in the seed furrow behind the planter disc openers.
	terbufos	Counter 15 G	75 g	May be applied in a T-band or in-furrow. For banded applications, place directly over the furrow in a 15 cm band ahead of the press wheel. In-furrow application, place all material directly in the open seed furrow, behind the planter disc openers.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
SEEDCORN MAGGOT				
Seed Treatment			**per 100 kg seed**	
Seedcorn maggot problems in corn are extremely rare in Ontario. Expect only 60%–70% control using seed treatments.	diazinon + lindane + captan			For all seed treatments use full rate and ensure good coverage of seed.
		Agrox B-3	340 g	Available as 2 kg container and will treat 600 kg of corn seed.
		Agrox D-L Plus	200 g	Available as a 600 g container and will treat 300 kg of corn seed. Use this product only on seed previously treated with captan or thiram.
		DL + C	200 g	Use this product only on seed previously treated with captan or thiram.
Soil Applied at Planting Only			**per 100 m (328 ft) row**	
In furrow application is safer to the applicator and non target animals then T-band application.	tefluthrin	Force 3 G	37.5 g	In-furrow only. Place directly in the seed furrow behind the planter disc openers.
	terbufos	Counter 15 G	75 g	Lock and load. May be applied in a T-band or in-furrow. For banded applications, place directly over the furrow in a 15 cm band ahead of the press wheel. In-furrow application, place all material directly in the open seed furrow, behind the planter disc openers.
SEEDCORN BEETLE				
Risk factors: no-till, cool, backwards spring, slow emergence conditions.				No registered products available at this time.
BLACK CUTWORM				
Soil Applied at Planting Only			**per 100 m (328 ft) row**	
Risk factors: winter annual weeds and volunteer wheat before planting, no-till, heavy soybean residue.	tefluthrin	Force 3 G	37.5 g	Control is not as good as a well timed rescue treatment. May be applied as a banded or in-furrow application. For banded applications, place directly in a 15 cm band ahead of the press wheel. In-furrow application, place all material directly in the open seed furrow, behind the planter disc openers.
Rescue Treatments			**per ha (per ac)**	
Scout early! Cutworms are easier to control when small. Look for leaf feeding (pinholes) by young climbing larvae as first sign of damage. If more than 10% of plants show leaf feeding, treating at this time will give nearly 100% control.	permethrin	Pounce EC	175–390 mL (70–156 mL)	Seedling stage only. Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application.
	cypermethrin	Ripcord 400 EC	175 mL (70 mL)	Seedling stage only. Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application. 21 days to harvest.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
BLACK CUTWORM (CONT'D)				
			per ha (per ac)	
	chlorpyrifos	Lorsban 4E	1.2–2.4 L (480–960 mL)	Seedling stage only. 70 days to harvest.
		Pyrinex 480 EC	1.2–2.4 L (480–960 mL)	Seedling stage only. Apply once per season. 7 days to harvest.
	cyhalothrin-lambda	Matador 120 EC	83 mL (34 mL)	Seedling stage only. Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application. 14 days to harvest.
EUROPEAN CHAFER (WHITE GRUB)				
Avoid planting corn if grub population is extreme — plant soybeans instead. No thresholds available at this time.				No registered products available at this time.
EUROPEAN CORN BORER				
To manage potential corn borer resistance, plant a minimum of 20% of your total acreage with non-Bt corn hybrids and position so that this refuge is no more than 400 m from any Bt corn. For more information regarding Bt corn and/or refuge options, see *A Grower's Handbook; Controlling European corn borer with Bt corn technology* found at www.ontariocorn.org/btguide.html		Transgenic Bt corn hybrids		Insecticides have generally not provided economic control of ECB in field corn. Using Bt transgenic corn provides much better control. Use corn hybrids that express the Bt toxin in the ear as well as the stalk to help avoid stalk and ear rot. Keep careful and accurate records as to where Bt and non-Bt hybrids are planted.
Seed corn only See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, to calculate economic thresholds.	deltamethrin	Decis 5.0 EC	250–300 mL (100–120 mL)	Ground or aerial application. Apply when egg masses begin to hatch but no later than when 1st pinhole feeding occurs on foliage. For 2nd brood in late planting, apply before tassels show. Repeat in 5–8 day intervals. Maximum 3 applications/yr. Do not feed silage or stubble to dairy cattle.
	cypermethrin	Ripcord 400 EC	175 mL (70 mL)	Apply when egg masses begin to hatch but no later than when 1st feeding occurs on foliage. For 2nd brood in late planting, apply before tassels show. Use a minimum 300–500 L water/ha for ground application and 11–22 L/ha for aerial application. Re-entry period when foliage dries. Maximum 3 applications/yr. 5 days to harvest.
	cyhalothrin-lambda	Matador 120 E	83 mL (34 mL)	Ground application only. Spray no later than 1st appearance of feeding. Spray no later than 14 days before silage harvest. No more than 3 applications per season.
	carbaryl	Sevin XLR Plus	2.5–4.0 L (1.0–1.6 L)	For larvae in whorls and foliage, treat entire plant. Repeat as necessary. For silks and ears, apply in 2–4 day intervals when silks first appear. 1 day to harvest. Follow precautions applying to honeybees.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
ARMYWORM (TRUE AND FALL)				
			per ha (per ac)	
Five to 6 larvae in an area 30 x 30 cm warrant chemical control. Treat if larvae < 2.0 cm long and threshold has been exceeded. If larvae have white eggs attached to them they are parasitized and may not need treatment.	trichlorfon	Dylox 420	1.5–2.75 L (600–1100 mL)	No more than 3 applications per season.
	carbaryl	Sevin XLR Plus	2.5–4.0 L (1.0–1.6 L)	For larvae in whorls and foliage, treat entire plant. Repeat as necessary. For silks and ears, apply in 2–4 day intervals. 1 day to harvest. Follow precautions regarding honeybees.
	cyhalothrin-lambda	Matador 120 E	83 mL (34 mL)	Spray no later than 1st appearance of feeding. Spray no later than 14 days before silage harvest. No more than 3 applications per season
CORN EARWORM				
Insecticides have generally not provided economic control of CEW in field corn. There may be some value in treating seed corn to maintain kernel quality.	cyhalothrin-lambda	Matador 120 E	83 mL (34 mL)	Spray no later than 1st appearance of feeding. Spray no later than 14 days before silage harvest. No more than 3 applications per season.
	cypermethrin	Ripcord 400 EC	175 mL (70 mL)	Ensure good coverage of ears and silks. Use minimum 300–500 L/ha of water for ground application and 11–22 L/ha for aerial application. 5 days to harvest. Maximum of 3 applications per year.
FLEA BEETLES				
Seed Treatment			**per 100 kg seed**	
Flea beetles are a vector of Stewart's bacterial wilt. It is uneconomical to spray corn with insecticides to protect against Stewart's wilt except in seed corn with highly susceptible inbreds.	imidacloprid	Gaucho 480 FL	520 mL	For seed corn only. Emergency registration only, expires March 2002. Ensure good coverage. For use in commercial seed treaters only.
POTATO STEM BORER				
No insecticides are recommended or registered.				
CORN LEAF APHID				
			per ha (per ac)	
Aphids are rarely a problem in corn in Ontario. Spray only if populations exceed 400 aphids per plant on average.	endosulfan	Thiodan 4 EC	2.75 L (1.1 L)	No more than 2 applications per season. 50 days to harvest.
SAP BEETLES				
Not an economic pest but can carry Fusarium. Chemical control is not recommended.				
SLUGS				
Usually not an economic pest because growing point is not affected. Chemical control is not recommended.				

TABLE 2–2. Corn (Field and Seed) Seed and Soil Applied Fungicide Recommendations

Active Ingredients	Product	Formulation	Corn Diseases: Fusarium Seedling Blight	Rhizoctonia Damping-off	Pythium Damping-off	Aspergillus Seed Rot	Penicillium Seed Rot
[illegible]							
Untreated Seed							
diazinon + lindane + captan	Agrox B-3	P (DB)	+	—	+	—	—
Seed Pretreated With Fungicide							
diazinon + lindane + captan	Agrox D-L Plus	P (DB)	For insect control only. Disease control via fungicide pretreatment.				
diazinon + lindane + captan	DL+C	P (DB)					
[illegible]							
captan	Captan Flowable	F	+	—	—	—	—
carbathiin + thiram	Vitaflo-280	F	+	+	—	—	—
fludioxonil	Maxim 480 FS	F	+	+	—	+	+
metalaxyl	Apron FL	F	—	—	+	—	—
metalaxyl-M	Apron XL	LS	—	—	+	—	—

DB = Drill Box Application F= Flowable LS = Liquid Suspension P= Powder

+ = Recommended for disease listed — = NOT recommended

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions etc.)
SEED ROTS AND SEEDLING BLIGHTS				
It is recommended that all seed corn be treated with a fungicide seed treatment to prevent early season pre-emergence and post-emergent damping-off problems. This will help reduce seed decay and seedling blights. Corn seedling diseases are prevalent under cool wet conditions that keep the soil temperatures below 13°C (55°F). Low-lying or poorly drained areas of the field are often the first to show disease problems. Seed rots and seedling blights are more severe in no-till or reduced tillage fields since heavy residue will keep soil temperatures cooler and wetter longer than conventional fields. Damping-off will occur in conventional fields when the crop is planted early into conditions that favour disease development or when environmental conditions cause the corn seed to sit in the ground for a prolonged period of time. Other factors that delay germination and emergence such as compaction, crusting, deep planting, etc. can also result in a poor stand. Plant vigour is often reduced in those plants that do survive.				
DAMPING-OFF *PYTHIUM*				
Seed Treatment			**per 100 kg seed**	
Can occur on all soil types but losses are greatest in cold, wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Plant when soil temperatures above 13°C (55°F). Treat seed with metalaxyl or metalaxyl-M. No known resistance but some degree of tolerance available in hybrids. Rotation has limited effect.	metalaxyl-M	Apron XL LS	20–40 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–110 mL	Do not graze or feed livestock on seeded area for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions etc.)
RHIZOCTONIA				
Seed Treatment			**per 100 kg seed**	
Can occur on all soil types. No known resistance. Remove excess moisture. Plant when soil temperatures are above 13°C (55°F).	fludioxonil	Maxim 480 FS	5.2–10.4 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting. 30 days to harvest.
	carbathiin + thiram	Vitaflo 280	280 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
FUSARIUM SEEDLING BLIGHT				
Seed Treatment				
Some level of resistance or tolerance available in hybrids. Rotate with other crops. Tillage has little affect. Treat seed with fungicide and reduce early season stresses. Plant when soil temperatures are above 13°C (55°F).	fludioxonil	Maxim 480 FS	5.2–10.4 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting. 30 days to harvest.
	carbathiin + thiram	Vitaflo 280	280 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	captan	Captan Flowable	200 mL	Mix with the amount of water required for the slurry treater equipment to be used.
ASPERGILLUS AND PENICILLUM SEED ROT				
Seed Treatment Penicillium seedling blight favours high temperatures and is found only until the nodal roots develop. Infected roots may appear blue-green. Aspergillus seed rot is not generally a problem in Ontario.	fludioxonil	Maxim 480 FS	5.2–10.4 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting. 30 days to harvest.
RUST				
			per ha (per ac)	
Rust is generally not a problem in Ontario except when infection begins early in the season. Field corn has good resistance when compared to seed corn, sweet corn and specialty corn hybrids. Foliar fungicides in field corn are not needed unless disease appears before corn tassels. Humid, cool conditions favour the disease.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply when rust pustules 1st appear. Can be tank mixed with Ripcord insecticide for insect and disease control. Under severe disease pressure a second application 14 days later may be necessary. 14 days to harvest.
NORTHERN CORN LEAF BLIGHT				
Not generally a problem in Ontario since good resistance available. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control not usually economical in field corn.				

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions etc.)
HELMINTHOSPORIUM LEAF SPOT				
Not generally a problem in Ontario since resistance hybrids available. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control not usually economical in field corn.				
EYE SPOT				
			per ha (per ac)	
Resistant varieties available. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control not usually economical in field corn.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply when disease first appears. Can be tank mixed with Ripcord insecticide for insect and disease control. 14 days to harvest.
GRAY LEAF SPOT				
Not confirmed in Ontario but has been increasing in the Great Lakes States. Some hybrids are tolerant to the disease. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control not usually economical in field corn.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply when disease first appears. Can be tank mixed with Ripcord insecticide for insect and disease control. 14 days to harvest.

3. Soybeans

INSECTS

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
SEEDCORN MAGGOT				
Seed Treatment			**per 100 kg seed**	
Consider insecticide seed treatments in early planted fields where large amounts of manure, green manure or residue have been recently incorporated or fields are freshly tilled and when cool backward emergence conditions are expected.	diazinon + lindane + captan			For all seed treatments use full rate and ensure good coverage of seed.
		Agrox B-3	340 g	Available as 2 kg container and will treat 625 kg of soybean seed.
		Agrox D-L Plus	200 g	Available as a 600 g container and will treat 300 kg of soybean seed. Use this product only on seed previously treated with captan or thiram.
		DL + C	200 g	Use this product only on seed previously treated with captan or thiram.
SLUG				
No chemical control available. Slugs often avoid contact by feeding below ground and rainfall easily washes the material from the leaves. See OMAFRA Publication 811, *Agronomy Guide for Field Crops,* for rotation and tillage recommendations.				
TWO-SPOTTED SPIDERMITES				
			per ha (per ac)	
Scout fields around the first week of July. Infestations usually move in from edge of field as hot spots. Spot spray when populations average 4 mites per leaf.	dimethoate	Cygon 4 E	1 L (400 mL)	Do not feed or allow livestock to graze treated forage. No more than two applications per season. 7 days to harvest.
		Lagon 480 EC	1 L (400 mL)	
POTATO LEAFHOPPER				
Potato leafhoppers are controlled in soybeans by plant resistance via leaf pubescence. Problems are rare in soybeans in Ontario.				No registered products available at this time.
BEAN LEAF BEETLE				
This insect vectors Bean Pod Mottle Virus. See OMAFRA Publication 811, *Agronomy Guide for Field Crops,* for sampling methods and management options.				No registered products available at this time.

TABLE 3–1. Soybean Seed and Soil Applied Fungicide Recommendations

			Soybean Diseases				
Active Ingredients	**Product**	**Formulation**	**Phytophthora sojae**	**Pythium Damping off**	**Phomopsis Seed Mould**	**Rhizoctonia damping off**	**Fusarium Seedling Blight**
Insect and Disease Control							
Untreated Seed							
diazinon + lindane + captan	Agrox B-3	P (DB)	—	+	—	—	+
Seed Pretreated With Fungicide							
diazinon + lindane + captan	Agrox D-L Plus	P (DB)	For insect control only. Disease control via fungicide pretreatment.				
diazinon + lindane + captan	D.L.+C.	P (DB)					
Disease Control							
captan	Captan	F	—	+[1]	+	—	+
carbathiin + thiram	Anchor	F (DB)	—	—	+	+	+
carbathiin + thiram	Vitaflo-280	F	—	—	+	+	+
metalaxyl	Apron FL	F	+	+	—	—	—
metalaxyl-M	Apron XL	LS	+	+	—	—	—

DB = Drill Box Application F = Flowable P = Powder LS = Liquid Suspension
+ = Recommended for disease listed — = NOT recommended
[1] Pythium control with captan can be inconsistent

Integrated Pest Management Options	**Active Ingredient**	**Trade Name**	**Rate**	**Comments (Days to harvest, label precautions, etc.)**
SOYBEAN CYST NEMATODE				
SCN is often confused with other common problems such as nutrient deficiencies, herbicide injury, soil compaction, drought, flooding or root rots. By the time above ground symptoms from SCN feeding become noticeable, most fields have lost 25%–30% yield potential to the nematode. Early detection through scouting and soil testing is critical. If you suspect SCN, plants should be carefully dug (not pulled) and soil gently removed from the roots. Cysts are white to yellow and about the size of a pin-head. Rotating non-host crops such as corn, wheat, alfalfa, clover or vegetable crops like tomatoes, with resistant varieties, will lower SCN populations and improve yields on SCN infested fields.				
PHYTOPHTHORA ROOT ROT				
Seed Treatment			**per 100 kg seed**	
Select soybean varieties that have both specific resistance (Rps genes such as 1K and 1C) and good partial resistance (tolerance) to all races of Phytophthora. Consult with your seed company for variety profiles. Primarily controlled through resistant varieties. Losses greatest in cold, wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. A small amount of tillage will help warm soil and increase surface drainage. Rotate with corn and wheat. Plant when soil temperatures above 13°C (55°F). Treat seed with metalaxyl or metalaxyl-M.	metalaxyl-M	Apron XL-LS	40 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–93 mL	Do not graze or feed livestock on seeded area for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
PHOMOPSIS SEED MOULD				
Seed Treatment			**per 100 kg seed**	
Most severe when cool, wet conditions delay harvest. Some varieties more susceptible than others. Fungicide seed treatments will improve the germination of low to moderately infected seed. Do not plant severely infected seed. Plant good quality seed with a germination rate of at least 80%–90%. Rotate with non host crops such as corn and wheat, remove excess surface residue and harvesting as early as possible.	carbathiin + thiram	Anchor	600 mL	Drill box application. Ensure uniform coverage on seed. Do not apply Anchor through commercial seed treating equipment or through an auger as excessive seed wetness may result. Do not graze or feed livestock on treated areas for 4 weeks after planting.
		Vitaflo 280	260 mL	Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.
	captan	Captan Flowable	280 mL	Mix with the amount of water required for the slurry treater equipment to be used.
RHIZOCTONIA DAMPING OFF				
Seed Treatment				
Can occur on all soil types and environmental conditions. Disease losses greatest when a dry spring is followed by wet conditions. Few management options exist since no resistant or tolerant varieties available. Crop rotation with corn and small grains can help minimize the disease.	carbathiin + thiram	Anchor	600 mL	Drill box application. Ensure uniform coverage on seed. Do not apply Anchor through commercial seed treating equipment or through an auger as excessive seed wetness may result. Do not graze or feed livestock on treated areas for 4 weeks after planting.
		Vitaflo 280	260 mL	Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.
PYTHIUM DAMPING OFF				
Seed Treatment				
Can occur on all soil types but losses are greatest in cold, wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Plant when soil temperatures above 13°C (55°F). Treat seed with metalaxyl or metalaxyl-M. No known resistance but some degree of tolerance available in cultivars. Rotation has limited affect.	metalaxyl-M	Apron XL LS	20–40 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–93 mL	Do not graze or feed livestock on seeded area for 4 weeks after planting.
	diazinon + lindane + captan	Agrox B-3	320 g	Available as a 2 kg container and will treat 625 kg of soybean seed. Use full rate and ensure good coverage of seed.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
FUSARIUM SEEDLING BLIGHT				
Seed Treatment			**per 100 kg seed**	
Cool, wet spring conditions favour infection. Resistant varieties not available. Minimize soil compaction and remove excess moisture through increased drainage. A small amount of tillage will help warm soil and increase surface drainage. Rotate with corn and wheat. Plant high quality seed when soil temperatures are above 13°C (55°F). Fungicide seed treatment recommended. Mounding or ridging soil at the base of the plants produce adventitious roots that can minimize losses.	carbathiin + thiram	Anchor	600 mL	Drill box application. Ensure uniform coverage on seed. Do not apply Anchor through commercial seed treating equipment or through an auger as excessive seed wetness may result. Do not graze or feed livestock on treated areas for 4 weeks after planting.
		Vitaflo 280	260 mL	Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.
	diazinon + lindane + captan	Agrox B-3	320 g	Available as a 2 kg container and will treat 625 kg of soybean seed. Use full rate and ensure good coverage of seed.
	captan	Captan Flowable	280 mL	Mix with the amount of water required for the slurry treater equipment to be used.

4. Forages

INSECTS

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
ALFALFA SNOUT BEETLE				
No chemical control available. See OMAFRA Publication 811, *Agronomy Guide for Field Crops,* for management information.				
ALFALFA WEEVIL				
			per ha (per ac)	
First Cut: If 40% of the stems have feeding damage in the tips, cut and remove from fields as soon as possible. If this level of damage occurs a week or more before optimum cutting time, then spray may be necessary. Second Cut: If damage was serious on first cut, feeding may continue and early re-growth should be carefully checked. Natural enemies are generally highly effective at controlling this pest. For the safety of these natural enemies, chemical control is not recommended unless pest population exceeds the action threshold. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information on action thresholds.	phosmet	Imidan 50 WP	2.25 kg (900 g)	Alfalfa only. Ground application only. Do not apply during bloom. Only 1 application per cutting. 7 days to cutting or grazing.
	dimethoate	Cygon 480 E Lagon 480 EC	425 mL (170 mL) 425 mL (170 mL)	Alfalfa, forage and pasture. Reduces alfalfa weevil larvae population. Ground and aerial application. Do not apply during bloom. 2 days to harvest and grazing. No more than 2 applications per season.
	cyhalothrin-lambda	Matador 120 E	83 mL (34 mL)	Alfalfa only. Apply when larvae are small and populations are high. Maximum of 3 applications per year. 14 days to cutting or grazing. 24 hr. re-entry period.
	azinphos-methyl	Guthion Solupak 50 WP Guthion 240 SC Sniper 50 W Clean Pak Sniper 240 E	1.12–1.75 kg (0.45–0.7 kg) 2.25–3.5 L (0.9–1.4 L) 1.12–1.75 kg (0.45–0.7 kg) 2.25–3.5 L (0.9–1.4 L)	Alfalfa and clover only. Use a minimum of 80 L of water/ha for ground application and 40 L/ha for aerial application. 21 days to harvest. Minimum re-entry period of 48 hr. Only 1 application per cutting. Back pack and hand-wand spraying prohibited.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
POTATO LEAFHOPPERS				
			per ha (per ac)	
Leafhoppers are most severe in new seedings and in regrowth under hot dry weather. Some resistant varieties having glandular hairs on the leaves and stems have been found to be effective. Use chemical control only if leafhoppers exceed the threshold, as insecticides will also kill effective natural enemies of alfalfa weevil. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for threshold charts.	dimethoate	Cygon 480 E Lagon 480 EC	425 mL (170 mL) 425 mL (170 mL)	Alfalfa, forage and pasture. Ground and aerial application. Do not apply during bloom. 2 days to harvest and grazing. No more than 2 applications per season.
	cyhalothrin-lambda	Matador 120 E	83 mL (34 mL)	Alfalfa only. Timing of application should be based on the presence of vulnerable pest development stages and significant populations only. Maximum of 3 applications per year. 14 days to cutting or grazing. 24 hr. re-entry period.
	azinphos-methyl	Guthion Solupak 50 WP Guthion 240 SC Sniper 50 W Clean Pak Sniper 240 E	1.12–1.75 kg (0.45–0.7 kg) 2.25–3.5 L (0.9–1.4 L) 1.12–1.75 kg (0.45–0.7 kg) 2.25–3.5 L (0.9–1.4 L)	Alfalfa and clover only. Use a minimum of 80 L of water/ha for ground application and 40 L/ha for aerial application. 21 days to harvest. Minimum re-entry period of 48 hr. Only 1 application per cutting. Back pack and hand-wand spraying prohibited.
EUROPEAN SKIPPER				
If 6 to 8 caterpillars in a 30 cm x 30 cm area are found as early as the brown headed stage, treat the field or the infested area. See Agronomy Guide for proper scouting procedures.	*Bacillus thuringiensis* (Bt)	Dipel 2X DF Thuricide HPC	140–275 g (60–115 g) 2.25 L (900 mL)	Timothy only. 0 days to cutting or grazing. 0 days to cutting or grazing.
GRASSHOPPERS				
Begin scouting in late June when grasshoppers are still young. Spraying insecticides on alfalfa will also kill the natural enemies of alfalfa weevil and lygus bugs.	malathion	Malathion 500 EC	2.25–2.75 L (0.9–1.1 L)	For alfalfa and clover. Do not apply during bloom. Apply when 75% of foliage shows feeding damage. Less effective below 20°C (68°F). 7 days to cutting or grazing.
	cyhalothrin-lambda	Matador 120 E	63–83 mL (26–34 mL)	Alfalfa only. Use higher rate when grasshoppers are larger, up to but not including winged adults (up to 2.5 cm in length) or when population is high. Ground application only. Maximum of 3 applications per year. 24 hr. re-entry period. 14 days to cutting or grazing.
	azinphos-methyl	Guthion Solupak 50 WP Guthion 240 SC Sniper 240 E	525–850 g (210–340 g) 1.1–1.75 L (440–700 mL) 1.1–1.75 L (440–700 mL)	Alfalfa and clover only. Use a minimum of 80 L of water/ha for ground application and 40 L/ha for aerial application. Minimum re-entry period of 48 hr. Only 1 application per cutting. Back pack and hand-wand spraying prohibited. 21 days to harvest.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
ALFALFA BLOTCH LEAFMINER				
			per ha (per ac)	
Natural enemies are highly effective at controlling this pest. For the safety of these natural enemies, chemical control is not recommended unless pest population exceeds the action threshold. See *Agronomy Guide for Field Crops* for more information.	dimethoate	Cygon 480 E Lagon 480 E	550 mL (220 mL) 550 mL (220 mL)	Alfalfa only. Ground and aerial application. Do not apply during bloom. Use at least 200 L/ha of water for ground application. No more than 2 applications/season. 2 days to cutting or grazing.
	phosmet	Imidan 50 WP	2.25 kg (900 g)	Alfalfa only. Do not apply during bloom. Spray when first signs of infestation are visible. 7 days to cutting or grazing.
ARMYWORM (TRUE AND FALL)				
Five to 6 larvae in an area 30 x 30 cm warrant chemical control. Treat if larvae < 2.0 cm long and threshold has been exceeded. If larvae have white eggs attached to them they are parasitized and may not need treatment.	carbaryl	Sevin XLR Plus	2.5–5.25 L (1.0–2.1 L)	Alfalfa, clover and forage grasses. 2 days to harvest.

DISEASES

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
PHYTOPHTHORA ROOT ROT				
Seed Treatment			**per 100 kg seed**	
Plant resistant varieties that are treated with metalaxyl or metalaxyl-M. Drain excess moisture and avoid compaction. Avoid stresses such as insects, weeds and untimely cuttings that may stress the plants and make them more susceptible to Phytophthora. Do not cut during wet conditions. Crop rotation has little affect on the disease. Promote lateral root growth with good fertility program.	metalaxyl-M	Apron XL LS	40 mL	For alfalfa, clover, and forage grasses. Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–110 mL	Do not graze or feed livestock on seeded area for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
PYTHIUM DAMPING OFF				
Seed Treatment			**per 100 kg seed**	
Fungicide seed treatment. Drain excess moisture and avoid compaction. Plant when soil and weather conditions favour rapid emergence and early growth of seedlings. Increase plant populations to compensate for any plant losses.	metalaxyl-M	Apron XL LS	20–40 mL 40 mL	Use 20–40 mL for forage grasses. Use 40 mL for alfalfa, clover, trefoil and vetch. Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–110 mL	Do not graze or feed livestock on seeded area for 4 weeks after planting.
FOLIAR AND STEM DISEASES				
VERTICILLIUM WILT				
Seed Treatment				
Resistant or highly resistant varieties best means of control. The fungus is spread primarily on the cutting bar of forage harvesting equipment. Before harvesting, clean the cutting bar with a 1% solution of bleach followed by a clean water rinse and oil spray. Cut the youngest fields first, working towards the oldest fields. Wait 2–3 years between alfalfa crops. Maintain a good weed control program since some weeds can be alternate hosts.	thiram	Thiram 75WP	360 g	Alfalfa only. Do not graze treated areas or feed clipping from treated areas to livestock.
WHITE MOULD				
Foliar Treatment			**per ha (per ac)**	
Some differences in susceptibility between cultivars exist. Fields established under minimum tillage may have more disease. Spring planting may reduce incidence.	benomyl	Benlate Benlate Toss-N-Go	1.5 kg (600 g)	For alfalfa seed production only. Apply at early bloom through to full bloom. Do not make more than 2 applications per year. Do not graze or feed treated hay to livestock.
LEAF SPOT AND STEM SPOT				
Foliar Treatment				
Timely harvesting of forages is important to reduce leaf loss and minimize disease in the regrowth. There are no practical control strategies available for leaf spot diseases in forages. Leaf spots can reduce the protein level in legume leaves, so it is important to balance the time of harvest between the optimum stage for highest protein (bud stage in alfalfa) and the level of leaf spot disease.	mancozeb	Dithane DG	1.46 kg (584 g)	For seed production only. Apply prior to 50% bloom. Maximum of 3 applications per year. Repeat 7–10 days after first application and 10 days after second application.

5. Cereals

INSECTS

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
WHEAT, BARLEY, OATS and RYE				
WIREWORMS				
Seed Treatment			**per 100 kg seed**	
See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for sampling methods.	carbathiin + thiram + lindane	Vitaflo Dual Purpose	260 mL (wheat) 325 mL (barley)	Drill box or commercial application. Do not graze or feed livestock on treated areas for 4 weeks after planting.
EUROPEAN CHAFER (WHITE GRUB)				
These grubs can follow soybean crops on sandy soils. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more details.				No registered products available at this time.
ARMYWORM (TRUE AND FALL)				
			per ha (per ac)	
Five to 6 larvae in an area 30 x 30 cm warrant chemical control. Treat if larvae < 2.0 cm long and threshold has been exceeded. If larvae have white eggs attached to them, they are parasitized and may not need treatment.	trichlorfon	Dylox 420 LC	1.5 L (0.6 L)	Wheat, barley and oats. 21 days to harvest
	carbaryl	Sevin XLR Plus	2.5–5.25 L (1.0–2.1 L)	14 days to harvest for wheat, rye and oats. 28 days to harvest for barley. See precautions applying to honeybees.
	methomyl	Lannate Toss-N-Go	270–540 g (108– 216 g)	Ground and aerial application. 20 days to harvest. Minimum period before re-entry is 24 hr.
CEREAL LEAF BEETLE				
Natural enemies are highly effective at controlling this pest. For the safety of these natural enemies, chemical control is not recommended unless pest population exceeds the action threshold of 1 larvae per stem. See OMAFRA Publication 811, *Agronomy Guide for Field Crops*, for more information.	malathion	Malathion 500 EC	2.2 L (880 mL)	7 days to harvest. Less effective below 20°C (68°F).
	azinphos-methyl	Guthion Solupak 50 WP	0.85–1.12 kg (0.34–0.45 kg)	For rye only. Use minimum of 80 L of water/ha for ground and 40 L/ha for aerial application. Apply only once per season. Do not harvest for food, feed or forage within 30 days of treatment. Minimum re-entry period is 48 hr.
		Guthion 240 SC	1.75–2.25 L (700–900 mL)	
		Sniper 50 W Clean Pak	0.85–1.12 kg (0.34–0.45 kg)	
		Sniper 240 E	1.75–2.25 L (700–900 mL)	

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
GRASSHOPPERS				
			per ha (per ac)	
More abundant in drier years. If populations are high enough, wheat heads may be clipped. Seedling winter wheat is also at risk. Infestations usually begin along field borders. Early season weed control can help eliminate food source for early season nymphs, however, late season weed control in and around the field will actually cause this insect to migrate from the weeds onto the crop and cause damage. If populations are high, spot spray in border areas that are infested before migration into the field occurs.	malathion	Malathion 500 EC	2.25–2.75 L (900–1100 mL)	7 days to harvest. Less effective below 20°C (68°F).
	cypermethrin	Ripcord 400 EC	50–70 mL (20–28 mL)	Ground and aerial application. Use lower rates for small grasshoppers and when soil temperatures are cool (15-20°C). Avoid spraying when temperatures are above 25°C. Repeat treatment as necessary. Do not graze treated crop or cut for hay. 60 days to harvest.
	cyhalothrin-lambda	Matador 120 E	63–83 mL (26–34 mL)	Ground or aerial application. Apply the low rate when grasshoppers are up to the 3rd nymphal stage (up to 1 cm in length) or when insect numbers are low. Apply the high rate when grasshoppers are larger, up to but not including winged adults (up to 2.5 cm in length) or when insect numbers are high. 3 applications per yr. 14 day interval from application to harvest or foraging. Do not graze or feed lactating dairy animals on treated green cereal forage or treated pasture. In wheat, do not apply within 28 days of harvest or 14 days of livestock foraging. In barley and oats do not apply within 28 days of harvest or 14 days of livestock foraging.
	carbaryl	Sevin XLR Plus	1.25–2.5 L (0.5–1.0 L)	14 days to harvest for wheat, rye and oats. 28 days to harvest for barley. See precautions applying to honeybees.
	azinphos-methyl	Guthion Solupak 50 WP	525–850 g (210–340 g)	For rye only. Use minimum of 80 L of water/ha for ground and 40 L/ha for aerial application. Apply only once per season. Do not harvest for food, feed or forage within 30 days of treatment. Minimum re-entry period is 48 hrs.
		Guthion 240 SC	1.1–1.75 L (440–700 mL)	
		Sniper 50 W Clean Pak	525–850 g (210–340 g)	
		Sniper 240 E	1.1–1.75 L (440–700 mL)	

TABLE 5–1. Wheat Seed and Soil Applied Fungicide Recommendations

Active Ingredient	Products	Formulation	Wheat Diseases: Seed-Borne: Common Bunt	Loose Smut	Seed-borne Septoria	Seed-borne Fusarium	Seed-borne Dwarf Bunt	Soil-Borne: Soil-borne Dwarf Bunt	Common Root Rot	Take All	Pythium Damping Off	Soil-borne Fusarium	Early Season: Powdery Mildew	Septoria
Seed Treatments with Insecticides														
carbathiin + thiram + lindane	Vitavax Dual Purpose	F	+	+	—	+	+	—	+	—	—	+	—	—
carbathiin + thiram	Vitaflo-280	F	+	+	—	+	+	—	+	—	—	+	—	—
difenoconazole + metalaxyl-M	Dividend XL	F	+	+	+	+	+	+	+[1]	+[1]	+	+	—	+[2]
difenoconazole + metalaxyl-M	Dividend XL RTA	F	+	+	+	+	+	+	+[1]	+[1]	+	+	—	+[2]
metalaxyl-M	Apron XL	F	—	—	—	—	—	—	—	—	+	—	—	—
tebuconazole	Raxil FL	F	+	+	—	+	—	—	+[1]	—	—	+	—	—
triadimenol	Baytan 30	F	+	+	—	—	—	—	—	+[1]	—	—	—	—

DB= Drill Box Application EC = Emulsifiable Concentrate F= Flowable P= Powder

+ = Recommended for disease listed — = Not Recommended [1] Suppression only [2] Winter wheat only

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
WHEAT				
SEED ROTS AND SEED-BORNE				
Use good quality, clean seed. All wheat seed needs to have a fungicide seed treatment applied to control soil-borne and seed-borne diseases such as seed rots and seedling blights, seed-borne Septoria, seed-borne Fusarium seedling blight, seed borne dwarf bunt, common bunt and loose smut. The best protection against seedling blights, smut and the bunts can be achieved through the use of a seed treatment that contains a combination of fungicides since no one fungicide is affective against all these diseases. Good coverage of the seed is essential since their performance will be reduced.				
SEED-BORNE SEPTORIA (ALSO STAGONOSPORA)				
Seed Treatment			**per 100 kg seed**	
Infected seed is lightweight and shriveled. Fungicide seed treatment is very effective against this disease. Other options include the use of tolerant varieties and disease-free seed. Plant into a well-prepared seed bed under good growing conditions. Use wheat in at least a 3 yr. rotation since the disease can survive in wheat residue.	difenoconazole + metalaxyl-M	Dividend XL	130 mL	Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	650 mL	For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
FUSARIUM (SEED-BORNE, SEED ROT AND SEEDLING BLIGHT)				
Seed Treatment				
Infected seed is lightweight and shriveled. Fungicide seed treatment is very effective against this disease. Other options include the use of tolerant varieties and disease-free seed. Plant into a well-prepared seed bed under good growing conditions. Use wheat in at least a 3 yr. rotation since the disease can survive in wheat residue. Avoid planting wheat after corn.	tebuconazole	Raxil FL	180–240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
SEEDLING DISEASES				
COMMON ROOT ROT (COMMON BLIGHT)				
Seed Treatment			**per 100 kg seed**	
Infected plants can be found individually or in irregular patches. These plants are often stunted and yellow (chlorotic) with a dark browning or blacking of the subcrown internodes. Drought and warm temperatures favor root rot. Maintain sound soil heath practices and use good 3 yr. crop rotation using non-host crops. Avoid soil compaction and deep seeding.	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	For suppression only. Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	For suppression only. For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	tebuconazole	Raxil FL	240 mL	For suppression only. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL	For suppression only. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	260 mL	For suppression only. Do not graze or feed livestock on treated areas for 4 weeks after planting.
FUSARIUM CROWN AND FOOT ROT				
Seed Treatment Cool, dry soils are favourable for disease development. Delay planting until conditions will result in a rapid and uniform emergence. Avoid planting after corn and maintain a balanced fertility program. Seed should be treated.	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	Suppression only. For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
PYTHIUM DAMPING OFF				
Seed Treatment Can occur on all soil types but losses are greatest in cold, wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Seed treatments containing metalaxyl or metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence.	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
PYTHIUM DAMPING OFF (CONT'D)				
Seed Treatment (cont'd)			**per 100 kg seed**	
	metalaxyl-M	Apron XL LS	20–40 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
PENICILLIUM AND ASPERGILLUS SEED ROT				
Seed Treatment				
Both of these diseases are considered storage moulds. Their incidence increases when wheat is stored under warm temperatures and moist conditions. Seed that is damaged is especially susceptible under these conditions. Maintain grain at less than 14% moisture and below 20°C (68°F). Avoid damaging seed during harvest or handling.	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
DWARF BUNT				
Seed Treatment				
Occurs on winter wheat, primarily in counties bordering Georgian Bay and Lake Huron where snow cover is deep and persistent in late winter and early spring. Plant seed that is free of bunt spores (black). Treat seed when bunt has been observed in the crop. Cut high with the combine. Wheat infected with dwarf bunt will be substantially shorter than healthy plants. Infected seed has a "fishy" smell. Raising the header reduces the amount of bunt balls being harvested. Coverage of the seed with fungicide seed treatments is important to their effectiveness. Avoid planting wheat into fields with soilborne dwarf bunt for 5–7 yr. since the fungus is very persistent.	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Both seed borne and soil borne control on winter wheat only. Good seed coverage and high rate of treatment necessary for soil-borne. Not for on-farm use. Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	Both seed borne and soil borne control on winter wheat only. Good seed coverage and high rate of treatment necessary for soil-borne. For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL	Seed-borne only. Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	260 mL	Seed-borne only. Do not graze or feed livestock on treated areas for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
LOOSE SMUT				
Seed Treatment			**per 100 kg seed**	
This fungus infects the embryo at flowering thus is seed-borne. Light rains or heavy dew and moderate temperature, 15°C–16°C (58°F–60°F) during flowering favour infection. Sow pedigree seed. This disease was quite important in Ontario wheat production but the incidence and hence its impact has been reduced substantially due to the effectiveness of fungicide seed treatments. Good coverage of seed with fungicide seed treatment important.	carbathiin + thiram	Vitaflo 280	330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	260 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	tebuconazole	Raxil FL	180– 240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	triadimenol	Baytan 30	50 mL	Must be diluted with water prior to treatment of seed to ensure uniform coverage. Treated seed will sometimes emerge slower than untreated. Avoid late seeding of winter cereals. Do not graze or feed livestock on treated areas for 40 days after planting.
TAKE-ALL				
Seed Treatment				
Carefully manage your soil fertility. Neutral to alkaline and infertile soils are most at risk. Do not apply lime before planting. Soils deficient in potassium and phosphorus cause plants to be more susceptible because of poor root development. Nitrate nitrogen increases disease severity. Control grasses and avoid early planting. Use a 3 yr. crop rotation and avoid planting wheat after wheat.	triadimenol	Baytan 30	100 mL	Suppression only. Must be diluted with water prior to treatment of seed to ensure uniform coverage. Treated seed will sometimes emerge slower than untreated. Avoid late seeding of winter cereals. Do not graze or feed livestock on treated areas for 40 days after planting.
	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Suppression only. Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	Suppression only. For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
COMMON BUNT				
Seed Treatment			**per 100 kg seed**	
Cool soil temperatures after seeding favours this disease. This disease was quite important in Ontario wheat production but the incidence and hence its impact has been reduced substantially due to the effectiveness of fungicide seed treatments. Use seed that is free of bunt spores (black). Infected seed produces "fishy" smell.	carbathiin + thiram	Vitaflo 280	230–330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	260 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	difenoconazole + metalaxyl-M	Dividend XL	65–130 mL	Controls both seed and soil-borne common bunt. Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	325–650 mL	Controls both seed and soil-borne common bunt. For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.
	tebuconazole	Raxil FL	180–240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	triadimenol	Baytan 30	50 mL	Must be diluted with water prior to treatment of seed to ensure uniform coverage. Treated seed will sometimes emerge slower than untreated. Avoid late seeding of winter cereals. Do not graze or feed livestock on treated areas for 40 days after planting.
FOLIAR, STEM AND HEAD DISEASES (See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for Zadok's cereal growth stages)				
EARLY SEASON *SEPTORIA* SPP.				
Seed Treatment			**per 100 kg seed**	
Early season septoria control may reduce the risk of later infection. However, if the flag leaf is disease free at the time of head emergence, a fungicide will not likely be necessary. Foliar fungicides will not be necessary.	difenoconazole + metalaxyl-M	Dividend XL	130 mL	Winter wheat only. Provides control for the first 6 weeks after planting. For full-season control apply foliar fungicide. Do not use in hopper box, planter box, slurry box or other non-commercial seed treatment applications at or immediately before planting. Do not graze, feed green forage or cut for hay within 55 days of planting.
		Dividend XL RTA	650 mL	Winter wheat only. Provides control for the first 6 weeks after planting. For full-season control, apply a foliar fungicide. For both commercial seed treatment plants and on-farm treatment using standard gravity flow or mist type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
LATE SEASON SEPTORIA SPP. (GLUME BLOTCH AND LEAF SPOT)				
Foliar treatment			**per ha (per ac)**	
Wet, windy weather and moderate temperatures favours disease development. Destroying volunteer wheat, reducing crop residue and crop rotation also helps reduce risk. Use less susceptible varieties. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for Zadok's cereal growth stages.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial. Apply at early signs of disease from tillering (Zadoks 21 growth stage) to head half emerged (Zadoks 55 growth stage). Can be tank mixed with several cereal herbicides. 45 days to harvest.
	mancozeb	Dithane M-45 80 WP Dithane DG Rainshield NT	1.1 kg — early (440 g) 2.25 kg —late (900 g)	Use lower rate for applications at Zadoks 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadoks 59 growth stage when head is fully emerged but prior to flowering. No more than 2 applications per yr. 40 days to harvest. Do not graze crop or cut for hay.
POWDERY MILDEW				
Seed Treatment			**per 100 kg seed**	
Powdery mildew is favoured by warm, humid weather. Early season powdery mildew control may reduce the risk of later infection. However, if the flag leaf is disease free at the time of head emergence, a fungicide will not be necessary. In areas prone to severe mildew, use the more resistant varieties of winter wheat. Bury crop residue and rotate out of wheat for at least 2 yrs.	triadimenol	Baytan 30	50 mL 100 mL	Use higher rate for winter wheat. Must be diluted with water prior to treatment of seed to ensure uniform coverage. Treated seed will sometimes emerge slower than untreated. Avoid late seeding of winter cereals. Do not graze or feed livestock on treated areas for 40 days after planting.
Foliar Treatment			**per ha (per ac)**	
	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. Can be tank mixed with several cereal herbicides. 45 days to harvest.
RUST (LEAF AND STEM)				
Leaf rust blows in from the southern United States late in the season. Stem rust has common barberry as an alternate host therefore removing this alternate host will help minimize stem rust. Use tolerant varieties. Use foliar treatments when flag leaf has 5–10 pustules (1% leaf area). See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for Zadok's cereal growth stages.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. Can be tank mixed with several cereal herbicides. 45 days to harvest.
	mancozeb	Dithane DG Rainshield NT	1.1 kg — early (440 g) 2.25 kg —late (900 g)	Leaf rust only. Use lower rate for applications at Zadoks 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadoks 59 growth stage when head is fully emerged but prior to flowering. No more than 2 applications per yr. 40 days to harvest. Do not graze crop or cut for hay.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
TAN SPOT				
			per ha (per ac)	
Reduced tillage and cool, cloudy humid weather promotes this disease. This disease survives in crop residues. Avoid planting wheat in conservation tillage fields in which wheat was grown during the preceding 2 yrs. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for Zadok's cereal growth stages.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. Can be tank mixed with several cereal herbicides. 45 days to harvest.
	mancozeb	Dithane DG Rainshield NT	1.1 kg —early (440 g) 2.25 kg —late (900 g)	Use lower rate for applications at Zadoks 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadoks 59 growth stage when head is fully emerged but prior to flowering. No more than 2 applications per yr. 40 days to harvest. Do not graze crop or cut for hay.
FUSARIUM HEAD BLIGHT				
Warm and prolonged wet conditions during flowering are necessary for infection to occur. Avoid planting into corn stubble since the fungus also causes Gibberella stalk rot in corn. Wheat should follow soybeans in the rotation. Remove or plough-down corn residues. See Fusarium forecasting Web page at www.ridgetownc.uoguelph.ca/CoInfo/OWN/Fusarium/Fusarium_Frame.htm to determine the Fusarium head blight risk for your area. Apply only when risk is high. Consult your local crop advisor for forecast information.	tebuconazole	Folicur 432 F	292 mL (117 mL)	Timing is critical. Heads need to be fully emerged (Zadoks 59). Spray within 2–5 days of head emergence. Ensure entire heads are covered. Apply in minimum of 94 L/ha of water. Emergency registration only, expired September 2000.

TABLE 5–2. Barley, Oats and Rye Seed and Soil Applied Fungicide Recommendations

Active Ingredient	Products	Formulation	Diseases					
			Barley			Oats		Rye
			Seed and Seedling Blight	Covered Smut	True Loose Smut	Covered Smut	Loose Smut	Fusarium Seedling Blight
INSECT AND DISEASE CONTROL								
Seed Treatments with Insecticides								
carbathiin + thiram + lindane	Vitavax Dual Purpose	F	+	+	+	—	—	—
DISEASE CONTROL								
carbathiin + thiram	Vitaflo 280	F	+	+	+	+	+	+
tebuconazole	Raxil FL	F	+[1]	+	+	—	—	—
triadimenol	Baytan 30	F	—	+	+	—	—	—

DB = Drill Box Application EC = Emulsifiable Concentrate F = Flowable P = Powder
+ = Recommended for disease listed — = Not Recommended [1] Also controls Fusarium seedling blight

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
BARLEY				
SEED ROT AND SEEDLING DISEASES				
SEED ROT AND SEEDLING BLIGHT				
Seed Treatment			**per 100 kg seed**	
Ensure good coverage of seed treatment on seeds. Rotation with non-host crops for at least 2 yrs will reduce risk. Use disease free seed and avoid deep seeding.	tebuconazole	Raxil FL	180–240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	325 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
COCHLIOBOLUS SEEDLING BLIGHT				
Seed Treatment				
Avoid continuous or overuse of barley. Avoid deep seeding. Turn under stubble to help reduce infection levels. Use resistant varieties.	tebuconazole	Raxil FL	180–240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
COVERED SMUT (COMMON BUNT)				
Seed Treatment			**per 100 kg seed**	
Infection can occur at temperatures of 14°C–25°C (57°F–68°F), especially when the soil moisture levels are high. Seed treatment is the primarily method of control.	tebuconazole	Raxil FL	180–240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	triadimenol	Baytan 30	50 mL	Spring Barley. Must be diluted with water prior to treatment of seed to ensure uniform coverage. Treated seed will sometimes emerge slower than untreated. Avoid late seeding of winter cereals. Do not graze or feed livestock on treated areas for 40 days after planting.
	carbathiin + thiram	Vitaflo 280	230–330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	325 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
LOOSE SMUT				
Seed Treatment				
Infection occurs during flowering. Conditions that promote the disease are wet, cloudy weather and moderate temperatures 16°C–22°C, (60°F–72°F). Sow pedigree seed. Moist weather at flowering promotes this disease. Use seed treatment on seed known to have high levels of infection.	tebuconazole	Raxil FL	180–240 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	triadimenol	Baytan 30	50 mL	Must be diluted with water prior to treatment of seed to ensure uniform coverage. Treated seed will sometimes emerge slower than untreated. Avoid late seeding of winter cereals. Do not graze or feed livestock on treated areas for 40 days after planting.
	carbathiin + thiram	Vitaflo 280	330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
	carbathiin + thiram + lindane	Vitaflo Dual Purpose	325 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
FOLIAR, STEM AND HEAD DISEASES				
NET BLOTCH, SPOT BLOTCH, SCALD, SEPTORIA LEAF SPOT				
			per ha (per ac)	
Avoid growing barley after barley, wheat or grasses. Plow down stubble and straw and plant early to avoid serious disease in July.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. Can be tank mixed with several cereal herbicides. 45 days to harvest.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
RUST (LEAF AND STEM)				
			per ha (per ac)	
Leaf rust spores are blown in from the United States and in most years late planted fields are most likely to show the disease. Alternate host is barberry. Remove or destroy alternate host from fence rows, etc., Plant early.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. Can be tank mixed with several cereal herbicides. 45 days to harvest.
OATS				
SEED ROTS AND SEEDLING DISEASES				
COVERED SMUT (COMMON BUNT) LOOSE SMUT				
Seed Treatment			**per 100 kg seed**	
Spread from year to year primarily through infected seed. Wind blown spores will infect florets within season. Use a fungicide seed treatment on infected seed.	carbathiin + thiram	Vitaflo 280	330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.
LEAF, STEM AND HEAD DISEASES				
SEPTORIA LEAF SPOT				
			per ha (per ac)	
Avoid planting oats after oats or mixed grain. Humid, wet, windy weather promotes disease.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. 45 days to harvest.
CROWN (LEAF) RUST				
European buckthorn is the alternate host. Can be a problem in central and Eastern Ontario. Use resistant varieties. Plant early which allows plants to mature before inoculum levels become heavy. Remove or destroy buckthorn.	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at early signs of disease from tillering to head half emerged. 45 days to harvest.
RYE				
SEEDLING BLIGHT				
Seed Treatment			**per 100 kg seed**	
Sow into a well prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment.	carbathiin + thiram	Vitaflo 280	230–330 mL	Do not graze or feed livestock on treated areas for 4 weeks after planting.

6. Dry Edible Beans

INSECTS

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
SEEDCORN MAGGOT				
Seed Treatment			**per ha (per ac)**	
Seedcorn maggot problems are rare in Ontario. Risk factors include cool, wet springs when germination is delayed. Expect only 60%–70% control when using seed treatments.	diazinon + captan + thiophanate-methyl	DCT	1 L of slurry	Available as 400 g container and will treat 77 kg of dry bean seed. Use full rate and ensure good coverage by applying as a slurry. To make slurry, use 520 g seed treatment per litre of water.
GREEN CLOVERWORM				
Several natural enemies help to keep populations below action thresholds. Insecticides are only recommended if populations are extremely high, as they will also kill the natural enemy population.	endosulfan	Thiodan 4 EC	1.5–2.5 L (0.6–1.0 L)	Do not apply on lima beans. Do not feed treated threshings or crop refuse to livestock. 2 days to harvest.
MEXICAN BEAN BEETLE				
Less of a problem in very hot, dry summers. Early maturing bean varieties and fall plantings may be grown with little or no injury. Several natural enemies help to keep populations below action thresholds. Insecticides are only recommended if populations are extremely high, as they will also kill the natural enemy population.	dimethoate	Cygon 4 E	0.7–1.0 L (280–400 mL)	Do not feed treated threshings or crop refuse to livestock. 7 days to harvest.
		Lagon 480 EC	0.7–1.0 L (280–400 mL)	Do not feed treated threshings or crop refuse to livestock. 7 days to harvest.
POTATO LEAFHOPPER				
Soil Applied at Planting Only				
Some resistant varieties available. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for action threshold charts and sampling methods.	phorate	Thimet 15 G	7.25–11 kg (2.9–4.4 kg)	Lock and load. Must be applied in a 10–15 cm band over the row behind the planter shoe, in front of the press wheel. Do not place in direct contact with seed. Do not feed the foliage of treated beans within 60 days.
Foliar Treatment	dimethoate	Cygon 4 E	0.7–1.0 L (280–400 mL)	Do not feed treated threshings or crop refuse to livestock. 7 days to harvest.
		Lagon 480 EC	0.7–1.0 L (280–400 mL)	Do not feed treated threshings or crop refuse to livestock. 7 days to harvest.

TABLE 6–1. Edible Bean Seed and Soil Applied Fungicide Recommendations

Active Ingredients	Product	Formulation	Dry Edible Bean Diseases			
			Phytophthora sojae	Pythium Damping off	Anthracnose	Fusarium Seedling Blight
Untreated Seed						
diazinon + captan + thiophanate-methyl	DCT	P	—	—	+	+
metalaxyl	Apron FL	F	+	+	—	—
metalaxyl – M	Apron XL	LS	+	+	—	—

DB= Drill Box Application EC = Emulsifiable Concentrate F= Flowable P= Powder
+ = Recommended for disease listed — = Not Recommended

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
SEEDLING DISEASES				
			per 100 kg seed	
Present in all fields and all soil types. Maintain or build up good soil tilth by following a good crop rotation (3 years between bean crops of any kind), don't overwork the soil and avoiding working it when it is too wet. Apply seed treatments that will help to protect the plant from root rots during germination and early growth. Use tolerant varieties	diazinon + captan + thiophanate-methyl	DCT	1 L of slurry	Due to anthracnose, all edible beans **MUST** be treated with DCT. Besides control of anthracnose, seedling blights and damping off are controlled. Use full rate and ensure good coverage by applying as a slurry. Available as 400 g container and will treat 77 kg of dry bean seed. To make slurry, use 520 g seed treatment per litre of water. For control of Pythium and Phytophthora root rots, add metalaxyl (Apron).
PYTHIUM DAMPING OFF				
Can occur on all soil types but losses are greatest on wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Seed should be treated with metalaxyl or metalaxyl-M and plant into warm soils 16°C (60°F). Rotate 3 to 4 years between bean crops.	metalaxyl-M	Apron XL LS	20–40 mL Apply with DCT	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–110 mL Apply with DCT	Do not graze or feed livestock on seeded area for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
PHYTOPHTHORA ROOT ROT				
			per 100 kg seed	
Can occur on all soil types but losses are greatest on wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Seed should be treated with metalaxyl or metalaxyl-M. Rotate 3 to 4 years between bean crops.	metalaxyl-M	Apron XL LS	40 mL Apply with DCT	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	46–110 mL Apply with DCT	Do not graze or feed livestock on seeded area for 4 weeks after planting.
ANTHRACNOSE				
Plant disease-free resistant varieties that have been treated with DCT. Stay out of bean fields when plants are wet since the disease can be spread by farm machinery, animals and humans, both within the field and between an infected field and a non-infected field. Incorporate infected bean debris. Rainy conditions favour disease development and increases potential spread. Rotate 3 to 4 years between edible bean crops.	diazinon + captan + triophanate-methyl	DCT	1 L of slurry	Available as 400 g container and will treat 77 kg of dry bean seed. Use full rate and ensure good coverage by applying as a slurry. To make slurry, use 520 g seed treatment per litre of water.
POD, LEAF, STEM AND POD DISEASES				
WHITE MOULD				
			per ha (per ac)	
Avoid soybeans, canola and other hosts in a three year rotation since these crops are susceptible to white mould. Rotate with non host crops such as wheat, corn and barley. In fields with a history of the disease, select varieties with an upright structure. Lower plant populations and increased row width promote rapid drying of the plants and soil surface and therefore reduces potential for infection. Avoid excess fertilization. Those fields at risk have a past history of white mould and above average foliage growth.	vinclozolin	Ronilan EG	1.0 kg (400 g) 2 app./yr 1.5 kg (600 g) 1 app./yr	Apply at 30%–50% flowering with repeat application 7–14 days later at full bloom if disease persists. For one application, apply 1.5 kg at early to mid-bloom (30%–50%). Do not feed treated bean refuse to livestock. Use sufficient water to ensure thorough coverage of plant foliage. Do not apply with products containing boron. 45 days to harvest for common, adzuki and mung beans.
	iprodione	Rovral WP	1.0–1.5 kg (0.4–0.6 kg)	Apply at 25%–75% bloom. 12 hr re-entry period. Do not feed treated bean refuse to livestock.
	thiophanate-methyl	Senator 70 WP	1.75–2.25 kg (700–900 g)	Apply when conditions favouring development of disease exist (warm, humid weather combined with heavy, dense crop foliage). Do not feed treated bean refuse to livestock. 14 days to harvest.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
WHITE MOULD (CONT'D)				
			per ha (per ac)	
	benomyl	Benlate Toss-N-GO	1.75–2.25 kg (700–900 g)	Apply between 25% and 50% bloom stage with enough water to obtain thorough coverage. Use higher rate for severe disease conditions. Do not tankmix or alternate Benlate with thiophanate products. Always use Benlate tankmixed with other suitable fungicides such as Manzate 200. Apply mixture same day. No more than 2 applications per year. Do not graze or feed treated bean refuse to livestock. 14 days to harvest.
	dicloran	Botran 75 WP	3.25 kg (1.3 kg)	Begin application when disease is anticipated, usually close to full bloom. Do not feed treated bean refuse to livestock. 2 days to harvest.

INSECTS

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
FLEA BEETLES				
Seed Treatment			**per 100 kg seed**	
Hot, dry weather favours this pest. Fortunately, once the crop reaches the 3–4 leaf stage, the plants are generally established and can compensate for the feeding damage. If beetle damage in excess of 50% of the cotyledon or leaf area, and if the weather is warm and dry, a foliar insecticide may be needed. Canola is a valuable honey source and is well used by honeybees. Keep insecticide application to a minimum while the crop is in bloom.	imidacloprid	Gaucho 480 FL	820–1640 mL	Use higher rate if flea beetle populations are high.
	carbathiin + thiram + lindane	Vitavax RS	2.25 L	Do not graze or feed livestock on seed area for 4 weeks after planting.
Soil Applied at Planting Only			**per ha (per ac)**	
	terbufos	Counter 5 G	5.5–11 kg (2.2–4.4 kg)	Seed-furrow treatment at planting time only. If high infestations are anticipated, use the higher rate. Use higher rate when using discer or air-seeder.
Post Emergence	cypermethrin	Cymbush 250 EC	140 mL (57 mL)	Ground and aerial application. 30 days to harvest. Ground application only. Apply when signs of insect damage appear. Repeat treatment if necessary. Use minimum 110 L of water per hectare. 30 days to harvest.
		Ripcord 400 EC	50 mL (20 mL)	
	deltamethrin	Decis 5 EC	100–150 mL (40–60 mL)	Ground and aerial application. 14 days to harvest.
	carbaryl	Sevin XLR Plus	500 mL (200 mL)	Seedling stage only (up to 4 weeks after plant emergence). Ground and aerial application. 60 days to harvest.
	carbofuran	Furadan 480 F	150 mL (60 mL)	Apply 2 weeks after seeding or when insects first noticed. Ground and aerial application. Do not use less than 100 L of water. 60 days to harvest. Minimum period for re-entry is 48 hours.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
DIAMONDBACK MOTH				
			per ha (per ac)	
Damage is most noticeable during dry years. Risk factors include weedy fields and no-till. Cool, cloudy weather reduces moth activity and if this persists, females will die before eggs are laid. Canola is a valuable honey source and is utilized by honeybees. Bees also pollinate the crop. If spraying an insecticide, ensure there are no honey producing hives in your area.	trichlorfon	Dylox 420 L	2.75 L (1.1 L)	Use if canola is in bloom because it is less hazardous to bees. 21 days to harvest.

DISEASES

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
SEEDLING DISEASES				
SEEDLING BLIGHT				
			per 100 kg seed	
Plant good quality seed when the conditions are good (warm) that promote rapid germination. Using a fungicide seed treatment will increase stand establishment. Maintain a good fertility balance and avoid excess fertilizer which promote disease and phytotoxicities. Avoid deep planting of seed.	carbathiin + thiram	Vitavax RS	1.25 L	Do not graze or feed livestock on seed area for 4 weeks after planting.
PYTHIUM DAMPING-OFF				
Plant good quality seed when the conditions are good (warm) that promote rapid germination. Using metalaxyl or metalaxyl-M seed treatment will increase stand establishment. Maintain a good fertility balance and avoid excess fertilizer which promote disease and phytotoxicities. Avoid deep planting of seed.	metalaxyl-M	Apron XL LS	20–40 mL	Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Read label for information regarding resistant strains of fungus.
	metalaxyl	Apron FL	32–110 mL	Do not graze or feed livestock on seeded area for 4 weeks after planting.

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
BLACKLEG				
Seed Treatment			**per 100 kg seed**	
There are differences in susceptibility between cultivars. Maintain at least 3 years between canola crops. Fungicide seed treatments will reduce seed-borne infection.	carbathiin + thiram	Vitavax RS	1.25 L	Do not graze or feed livestock on seed area for 4 weeks after planting.
Foliar Treatment			**per ha (per ac)**	
	propiconazole	Tilt 250 E	500 mL (200 mL)	Ground and aerial application. Apply at rosette stage. Do not feed treated canola refuse to livestock. 60 days to harvest.
	azoxystrobin	Quadris	500 mL (200 mL)	Apply at 2–6 leaf stage. See label for information regarding resistant strains of fungus. Plantback interval of 30 days for broadleaf and root crops and 45 days for cereals required. 30 days to harvest.
SCLEROTINIA STEM ROT (WHITE MOULD)				
The disease is often a problem when canola follows canola, white beans, soybeans or sunflowers. Use clean seed and a four or five year rotation with non-host crops such as corn, wheat, barley or oats. At present, no resistant varieties exist. Keep fields clean of broad-leaved weeds since many are alternate hosts.	vinclozolin	Ronilan EG	0.5 kg (0.2 kg) for 2 applications	For two applications, apply first at 20%–30% flowering and second 7 days later at late bloom (50%) if disease persists.
			0.75–1.0 kg (300–400 g) for 1 application	For single application at higher rates, apply at 20%–50% flower. Do not feed treated canola refuse to livestock. Use sufficient water to ensure thorough coverage of plant foliage. Do not apply with products containing boron. 40 days to harvest.
	iprodione	Rovral WP	1.0–1.5 kg (0.4–0.6 kg)	Ground and aerial application. Apply at 20%–30% bloom. 12 hour re-entry period.
	azoxystrobin	Quadris	700–1000 mL (283–405 mL)	Apply at early bloom (prior to 30% bloom). See label for information regarding resistant strains of fungus. Plantback interval of 30 days for broadleaf and root crops and 45 days for cereals required. 30 days to harvest.
	benomyl	Benlate Toss-N-GO	1.0–1.5 kg (400–600 g)	Apply during 20%–30% bloom stage. Do not tankmix or alternate Benlate with thiophanate products. Always use Benlate tankmixed with other suitable fungicides such as Manzate 200. Apply mixture same day. No more than 2 applications per year. Do not feed treated canola refuse to livestock.

8. Stored Grain

INSECTS

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
CORN, WHEAT AND SOYBEANS				
RUSTY GRAIN BEETLE				
Protectant The key to controlling stored grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for more information on Stored Grain Insect Management.	diatomaceous earth	Protect-It	*Empty bin:* 500 per 100 m^2 *Stored grain:* 500–1000 g/ metric tonne of grain.	Can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C (59°F). See label for spot and crack treatment rates. For wheat grain treatment, 100 g per metric tonne of wheat can be used to control rusty grain beetle. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into storage facility.
Fumigant			**per 100 m^3**	
	aluminum phosphide		*Grain bin:*	Must be applied by a professional licensed applicator. Do not fumigate below 5°C (40°F). Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.
		Fumitoxin	880–2560 pellets 250–500 tablets	
		Phostoxin	880–2560 pellets 250–500 tablets	
		Gastoxin	880–2500 pellets 180–500 tablets	

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
INDIAN MEAL MOTH				
Protectant The key to controlling stored grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for more information on Stored Grain Insect Management.	diatomaceous earth	Protect-It	*Empty bin:* 500 per 100 m^2 *Stored grain:* 500–1000 g per metric tonne of grain.	Apply at monthly intervals with the first appearance of moths and continue until early fall. In severe infestations, break up webbing with a rake before dusting and make second application 2 weeks later. Can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C (59°F). See label for spot and crack treatment rates. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into storage facility.
Fumigant			**per 100 m^3**	
	aluminum phosphide	Fumitoxin	*Grain bin:* 880–2560 pellets 250–500 tablets	Must be applied by a professional licensed applicator. Do not fumigate below 5°C (40°F). Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is as tightly sealed as possible. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.
		Phostoxin	880–2560 pellets 250–500 tablets	
		Gastoxin	880–2500 pellets 180–500 tablets	
GRANARY WEEVIL				
Protectant The key to controlling stored grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for more information on Stored Grain Insect Management.	diatomaceous earth	Protect-It	*Empty bin:* 500 g per 100 m^2 *Stored grain:* 500–1000 g per metric tonne of grain.	Can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C (59°F). See label for spot and crack treatment rates. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into storage facility.
Fumigant			**per 100 m^3**	
	aluminum phosphide	Fumitoxin	*Grain bin:* 880–2560 pellets 250–500 tablets	Must be applied by a professional licensed applicator. Do not fumigate below 5°C (40°F). Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is as tightly sealed as possible. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.
		Phostoxin	880–2560 pellets 250–500 tablets	
		Gastoxin	880–2500 pellets 180–500 tablets	

Integrated Pest Management Options	Active Ingredient	Trade Name	Rate	Comments (Days to harvest, label precautions, etc.)
LESSER GRAIN BORER				
Fumigant			**per 100 m³**	
The key to controlling stored grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for more information on Stored Grain Insect Management.	aluminum phosphide	Fumitoxin	*Grain bin:* 880–2560 pellets 250–500 tablets	Must be applied by a professional licensed applicator. Do not fumigate below 5°C (40°F). Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is as tightly sealed as possible. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.
		Phostoxin	880–2560 pellets 250–500 tablets	
		Gastoxin	880–2500 pellets 180–500 tablets	
PEA/BEAN WEEVILS				
Fumigant	aluminum phosphide		*Grain bin:*	Must be applied by a professional licensed applicator. Do not fumigate below 5°C (40°F). Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is as tightly sealed as possible. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.
The key to controlling stored grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, *Agronomy Guide for Field Crops* for more information on Stored Grain Insect Management.		Fumitoxin	880–2560 pellets 250–500 tablets	
		Phostoxin	880–2560 pellets 250–500 tablets	
		Gastoxin	880–2500 pellets 180–500 tablets	

9. Appendices

APPENDIX A. Manufacturers of Pesticides Recommendation in Publication 812

Aventis CropScience Canada
295 Henderson Drive
Regina, Saskatchewan S4N 6C2
Tel 1-888-283-6847
Fax (905) 854-4478
www.ca.cropscience.aventis.com

BASF Canada Inc.
345 Carlingview Drive
Toronto, Ontario M9W 6N9
Tel 1-800-565-9586
Fax (416) 674-2588
www.basf.com

Bayer Inc. Agricultural Division
77 Belfield Road
Etobicoke, Ontario M9W 1G6
Tel 1-800-778-9957
Fax (416) 614-1058
www.bayer.ca/agriculture

Dow AgroSciences Solutions Centre
#201-1144 29th Avenue NE
Calgary, Alberta T2E 7P1
Tel 1-800-667-3852
(403) 735-8800
Fax 1-888-296-6188
www.dowagro.ca

Dupont Canada Inc.
7070 Mississauga Road, Box 2300
Streetsville, Ontario L5M 2H3
Tel 1-800-667-3925
(905) 821-3300
Fax (905) 821-5505
www.dupont.ca

Engage Agro Corp.
315 Woodlawn Road West
Guelph, Ontario N1H 7K8
Tel (519) 826-7878
Fax (519) 826-7675
www.engageagro.com

Growmark Inc.
200 Argentia Road
P.O. Box 634
Mississauga, Ontario L5M 2C1
Tel (905) 814-4266
Fax (905) 814-4341
www.growmark.com

Gustafson Partnership
5-160 Research Lane
Guelph Ontario N1G 5B2
Tel (519) 767-3366
Fax (519) 767-9598
www.gustafson.ca

Interprovincial Cooperative Ltd.
945 Marion St.
Winnipeg, Manitoba R2J 0K7
Tel (204) 233-3461

Norac Concepts Inc.
PO Box 62023
Orleans ON K1C 7H8
Tel (613) 841-2907
Fax (613) 841-2908
www.noracconcepts.com

Novartis Crop Protection Canada Inc.
140 Research Lane
University of Guelph
Guelph, Ontario N1G 4Z3
Tel (519) 836-5665
Fax (519) 823-8439
www.cp.ca.novartis.com

Rohm and Haas Canada Inc.
2 Manse Road
West Hill, Ontario M1E 3T9
Tel 1-800-205-7766
Fax (416) 287-4495
www.rohmhaas.com

United Agri Products
789 Donnybrook Drive
Dorchester, Ontario N0L 1G5
Tel 1-800-265-4624
(519) 268-8001
Fax (519) 268-8013
www.uap.ca

Valent BioSciences Canada Ltd.
19 Wildan Drive
Box 19
Freelton, Ontario L0R 1K0
Tel (905) 659-0886
Fax (905) 659-0885
www.valent.com

Zeneca Agro
Suite 250
3115 12th Street NE
Calgary, Alberta T2E 7J2
Tel (403) 219-5400
Fax (403) 219-5401
www.zeneca.ca

APPENDIX B. OMAFRA Field Crop Staff and Resource Centres

Specialty	Field Crop Staff	E-mail Address	Phone/Fax	Resource Centre
Alternate Production Systems Specialist	Brian Hall	brian.hall@omafra.gov.on.ca	(519) 271-0083	Stratford
Applied Research Coordinator — Field Crops	Ian McDonald	ian.mcdonald@omafra.gov.on.ca	(519) 824-4120, Ext. 6707 Fax (519) 763-8933	Guelph
Biosolids Specialist	Michael Payne	michael.payne@omafra.gov.on.ca	(519) 271-4496	Stratford
Cereals Specialist	Peter Johnson	peter.johnson@omafra.gov.on.ca	(519) 271-8180	Stratford
Corn Industry Program Lead	Greg Stewart	greg.stewart@omafra.gov.on.ca	(519) 824-4120, Ext. 4865 Fax (519) 763-8933	Guelph
Emerging Crops Specialist	Scott Banks	scott.banks@omafra.gov.on.ca	(613) 258-8359	Kemptville
Entomologist, Field Crops Program Lead	Tracey Baute	tracey.baute@omafra.gov.on.ca	(519) 674-1696	Ridgetown
Field Crops, IPM Program Lead — Bilingual	Gilles Quesnel	gilles.quesnel@omafra.gov.on.ca	(613) 258-8250	Kemptville
Forage Specialist	Joel Bagg	joel.bagg@omafra.gov.on.ca	(705) 324-5856	Lindsay
IPM Modelling Specialist	Heather Griffiths	heather.griffiths@omafra.gov.on.ca	(519) 674-1694	Ridgetown
Nutrient Management Field Crops Program Lead	Christine Brown	christine.brown@omafra.gov.on.ca	(519) 537-8305	Woodstock
Pathologist — Field Crops Program Lead	Albert Tenuta	albert.tenuta@omafra.gov.on.ca	(519) 674-1617	Ridgetown
Research Coordinator Northwestern Ontario	Gordon Scheifele	gordon.scheifele@omafra.gov.on.ca	(807) 475-1373	Thunder Bay
Soil Fertility Specialist	Keith Reid	keith.reid@omafra.gov.on.ca	(519) 271-9269	Stratford
Soil Management Specialist — Field Crops	Adam Hayes	adam.hayes@omafra.gov.on.ca	(519) 674-1621	Ridgetown
Soybean Specialist	Vacant			Stratford
Weed Management Field Crops Program Lead	Hugh Martin	hugh.martin@omafra.gov.on.ca	(519) 824-4120, Ext. 2580 Fax (519) 763-8933	Guelph

APPENDIX B. OMAFRA Field Crop Staff and Resource Centres (Continued)

Brighton Resource Centre 95 Dundas St. E RR#3 Brighton, ON K0K 1H0	Phone (613) 475-1630 Fax (613) 475-3835
Delhi OMAFRA Southern Crop Protection and Food Research Centre Schafer Rd. Box 186, Delhi, ON N4B 2W9	Phone (519) 582-7220 Fax (519) 582-4504
Fergus Resource Centre RR#1, County Road 18, Wellington Place Fergus, ON N1M 2W3	Phone (519) 846-0941 Fax (519) 846-8178
Harrow OMAFRA Greenhouse and Processing Crops Research Centre 2585 County Road 20, Harrow, ON N0R 1G0	Phone (519) 738-2251 Fax (519) 738-4564
Kemptville Resource Centre Box 2004, Concession Rd, Kemptville, ON K0G 1J0	Phone (613) 258-8295 Fax (613) 258-8392
Lindsay Resource Centre 322 Kent St. W, Lindsay, ON K9V 2Z9	Phone (705) 324-6125 Fax (705) 324-1638
London Resource Centre 667 Exeter Road, London, ON N6E 1L3	Phone (519) 873-4070 Fax (519) 873-4062
New Liskeard Resource Centre 280 Armstrong St. Box 4070, New Liskeard, ON P0J 1P0	Phone (800) 461-6132 Fax (705) 647-7993
Ridgetown Resource Centre Agronomy Building, Ridgetown College Box 400, Main St. E Ridgetown, ON N0P 2C0	Phone (519) 674-1690 Fax (519) 674-1564
Simcoe Resource Centre P.O. Box 587 Blueline Rd & Hwy #3, Simcoe, ON N3Y 4N5	Phone (519) 426-7120 Fax (519) 428-1142
Stratford Resource Centre 581 Huron St., Stratford, ON N5A 5T8	Phone (519) 271-0280 Fax (519) 273-5278

APPENDIX B. OMAFRA Field Crop Staff and Resource Centres (Continued)

Thunder Bay Resource Centre 335 Euclid Ave., Thunder Bay, ON P7E 6G6	Phone (807) 475-1373 Fax (807) 475-1219
Vineland Resource Centre Adv. Serv. Building, Box 8000, 4890 Victoria Avenue North Vineland Station, ON L0R 2E0	Phone (905) 562-4147 Fax (905) 562-5933
Woodstock Resource Centre Box 666, Hwy. #59 N Woodstock, ON N4S 7Z5	Phone (519) 537-6621 Fax (519) 539-5351

APPENDIX C. Ontario Classification Schedules

Explanation of Schedules	
Schedule 1	Restricted. Use permit only.
Schedule 2	Restricted to certified agriculturalists, licenced exterminators, registered custom sprayers and permit holders.
Schedule 3	Agriculturists and consumer use.
Schedule 4	"Domestic" products only.
Schedule 5	Limited to application on agricultural land. Similar to Schedule 2.
Schedule 6	Similar to Schedule 4 but may be registered for agricultural/commercial use. Container size 1 litre or greater.

For more information on the regulatory aspects of the classification, please contact the Ministry of the Environment office nearest you. See Appendix D for a listing of MOE offices.

APPENDIX D. Ontario Ministry of the Environment Pesticide Control Offices

REGION County	PESTICIDES OFFICER Address	Telephone
Central Region Toronto, Halton, Peel York, Durham	**Charles Zubovits** 5775 Yonge St, 8th Floor Toronto, Ontario M2M 4J1	(416) 326-3671 Toll Free 1-800-810-8048 Fax (416) 325-6347
West-Central Region Haldimand-Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant	**Paul McCubbin** Ontario Government Building 119 King St. West, 12th Floor Hamilton, Ontario L8P 4Y7	(905) 521-7667 Fax (905) 521-7820
Eastern Region Frontenac, Hastings, Lennox & Addington, Prince Edward, Leeds & Grenville, Prescott & Russell, Stormont/Dundas & Glengarry , Haliburton, Peterborough, Victoria, Northumberland, Renfrew, Ottawa-Carleton, Lanark, District of Nipissing (Twsps of Airy, Murchison, Dickens, Lyell and Sabine)	**Andrew Morley** **Laurel Grills** 133 Dalton Avenue P.O. Box 820 Kingston, Ontario K7L 4X6	(613) 549-4000 Toll Free 1-800-267-0974 Fax (613) 548-6908
Southwestern Region Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth,Simcoe	**Doug Morrow** **Wray Lampman** 695 Exeter Road, 2nd Floor London, Ontario N6E 1L3	(519) 873-5041 (519) 873-5048 Fax (519) 873-5020
Northern Region Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma East, Cochrane East, Muskoka Kenora, Rainy River, Thunder Bay, Algoma West, Cochrane West, Timmins	**John Negusanti** 199 Larch Street, Ste 1101 Sudbury, Ontario P3E 5P9	(705) 564-3249 Fax (705) 564-4180
	Don Mitchell 435 James St. S., Suite 331 Thunder Bay, Ontario P7E 6S7	(807) 475-1712 Fax (807) 475-1745
Standards Development Branch	Pesticides Section 40 St. Clair Avenue West, 7th Floor Toronto, Ontario M4V 1M2	(416) 327-5519 Fax (416) 327-2936
Approvals Branch	Pesticides Licensing 2 St. Clair Avenue West, 12A Floor Toronto, Ontario M4V 1L5	(416) 314-8001 Fax (416) 314-8452

APPENDIX E. Diagnostic Service

Samples for disease diagnosis, insect or weed identification, nematodes counts and Verticillium testing can be sent to:

Pest Diagnostic Clinic
Laboratory Services Division
University of Guelph
95 Stone Rd. W.,
GUELPH, Ont., N1H 8J7
Telephone: (519) 767-6256 Fax: (519) 767-6240
E-mail: *pdc@lsd.uoguelph.ca*

Payment must accompany samples at the time of submission.

SUBMISSION FORMS ARE AVAILABLE AT:
www.uoguelph.ca/pdc

Charges will be applied to each sample submitted.
Payment: Please make cheque payable to the University of Guelph. VISA and Mastercard are also accepted. Please do not mail cash.

FEE SCHEDULE

Procedures	Price/Sample
Plant Diseases	
Diagnosis not requiring plating	$25
Diagnosis requiring plating	$40
Turf diagnosis	$50
Bacterial identification using Biolog®	$95
Detection of virus using Transmission Electron Microscopy	$85
Detection of virus using ELISA (turn around time = 5 working days, Bulk rates available)	$60
Weed Identification	$40
Insects	
Basic identification	$25
Identification requiring dissection and/or extensive keys	$40
Nematode and Verticillium Counts	**Price/Sample**
Nematodes extracted from soil (Bearman Pan Method)	$25
Soybean Cyst Nematode & Egg Count	$35
Nematodes extracted from roots	$60
Verticillium Count	$60
Turn Around Time	
Nematodes extracted from soil	7 or 8 days
Nematodes extracted from roots	15 days
Cyst count	3 or 4 days

How to Sample for Nematodes

Soil

When to Sample

Soil and root samples can be taken at any time of the year whenever the soil is not frozen. In Ontario nematode soil population levels are generally at their highest in May-June and again in September-October.

How to Sample Soil

Samples should be taken with a soil sampling tube, trowel or narrow bladed shovel. Soil should be sampled to a depth of 20–25 cm (8 –10 in). If the soil is bare, the top 2 cm (1 in.) should be removed prior to sampling. A sample should consist of 10 or more subsamples combined. Mix well. Then take a sample of 1/2 L to 1 L (1 pint to 1 quart) from this. No one sample should represent more than 2.5 ha (6.25 ac.)

Subsamples should be mixed in a clean pail or plastic bag.

Sampling Pattern

If living crop plants are present in the sample area, samples should be taken within the row and from the area of the feeder root zone (with trees this is the drip line).

Number of Subsamples

Based on the total area sampled

500 m^2 (5,400 ft^2)	10 subsamples
500 m^2 – 0.5 ha (5,400 ft^2 – 1.25 ac.)	25 subsamples
0.5 ha – 2.5 ha (1.25 - 6.25 ac.)	50 subsamples

Roots

From small plants sample entire root system plus adhering soil. For large plants, 10–20 g (1/2–1 oz.) fresh weight should be dug from the feeder root zone and submitted.

Problem Areas

Soil and root samples should be taken from the margins of the problem area where the plants are still living. If possible, samples should also be taken from healthy areas in the same field. If possible, both soil and root samples should be taken from problem and healthy areas in the same field.

Sample Handling

Soil Samples

Place in plastic bags as soon as possible after collecting.

Root Samples

Place in plastic bags and cover with moist soil from the sample area.

Storage

Samples should be stored between 5°C and 10°C (40°F- 50°F) and should not be exposed to direct sunlight or extreme heat or cold (freezing). **Only living nematodes can be counted. Accurate counts are dependent on proper handling of samples**

Submitting Plant for Disease Diagnosis or Identification

Sample Submission Forms

Forms can be obtained from your local OMAFRA office. Carefully fill in all of the categories on the form. In the space provided draw the most obvious symptom and the pattern of the disease in the field. It is important to include the cropping history of the area for the past 3 years and this year's pesticide use records.

Choose a complete, representative sample showing early symptoms. Submit as much of the plant as is practical, including the root system, or several plants showing a range of symptoms. For turfgrass, submit a 10-15 cm, square piece of turf, including thatch and at least 5 cm of soil. The sample should be taken from the outside edge of a ring or patch and include healthy and unhealthy turf and the interface between. If symptoms are general, collect the sample from an area where they are of intermediate severity. **Completely dead material is usually inadequate for diagnosis.** Plant specimens submitted for identification should at least include a 20 to 25 cm sample of the top portion of the stem with lateral buds, leaves, flowers or fruits in identifiable condition. Wrap plants in newspaper and put in a plastic bag. Tie the root system off in a separate plastic bag to avoid drying out and soil contaminating the leaves. **DO NOT** add moisture, as this encourages decay in transit. Cushion specimens and pack in a sturdy box to avoid damage during shipping. Avoid leaving specimens to bake or freeze in a vehicle or in a location where they could deteriorate.

Delivery

Delivery to the Pest Diagnostic Clinic should be made as soon as possible by first class mail or by courier at the beginning of the week.

Submitting Insect Specimens for Identification

Collecting Samples

Dead, hard bodied insects and spiders should be placed in vials or boxes and cushioned with tissues or cotton. Soft bodied insects and caterpillars should be placed in vials containing alcohol. Do not use water as this will result in rot. Do not tape insect to paper or send them loose in an envelope.

Live insects should be placed in a container with enough plant "food" to support them during transit. Be sure to write "live" on the outside of the container.

APPENDIX F. Other Contacts

AGRICULTURE & AGRI-FOOD CANADA RESEARCH CENTRES

Eastern Cereals and Oilseeds Research Centre
960 Carling Avenue
Ottawa, K1A 0C6
Tel (613) 759-1952
http://res2agr.ca/ecorc/welcome.htm

Greenhouse and Processing Crops Centre
Harrow N0R 1G0
Tel (519) 738-2251
http://res2.agr.ca/harrow/

Southern Crop Protection and Food Research Centre
http://res2.agr.ca/london/pmrc/pmrchome.html

1391 Sandford Street
London N5V 4T3
Tel (519) 457-1470

Vineland Research Farm
4902 Victoria Avenue North
Vineland L0R 2E0
Tel (905) 562-4113

Delhi Research Farm
Box 186 Schafer Road
Delhi N4B 2W9
Tel (519) 582-1950

CANADIAN FOOD INSPECTION AGENCY REGIONAL OFFICES (PLANT PROTECTION)

www.cifa-acia.agr.ca

Belleville
345 College Street East
Belleville, K8N 5S7
Tel (613) 969-3333

Brantford
Federal Building, Dalhousie & Queen St., P.O. Box 637
Brantford, N3T 5P9
Tel (519) 751-8157

Hamilton
709 Main Street West, Suite 101
Hamilton, L8S 1A2
Tel (905) 572-4152

London
457 Richmond Street, Suite 404
London, N6A 3E3
Tel (519) 645-4021

Niagara Falls
Mailing address: P.O. Box 35, Niagara Falls, L2E 6S8

Street address: 4551 Zimmerman Avenue
Niagara Falls, L2E 3M5
Tel (905) 357-5981

Ottawa District
3 Observatory Crescent
Building #3 Central, Experimental Farm
Ottawa, K1A 0C9
Tel (613) 759-1571

Toronto
401 Champagne Drive, Unit 1
Downsview, M3J 2C6
Tel (416) 954-1714

Windsor
441 University Avenue West, Suite 208
Windsor, N9A 5P9
Tel (519) 252-7095

UNIVERSITY OF GUELPH

Main Campus
Guelph, N1G 2W1
Tel (519) 824-4120
www.uoguelph.ca

Alfred College
Alfred, K0B 1A0
Tel (613) 679-2218
www.alfredc.uoguelph.ca

Kemptville College
Kemptville, K0G 1J0
Tel (613) 258-8336
www.kemptvillec.uoguelph.ca

Ridgetown College
Ridgetown, N0P 2C0
Tel (519) 674-1500
www.ridgetownc.on.ca

Department of Plant Agriculture

www.plant.uoguelph.ca

Department of Plant Agriculture, Kettleby
1125 Woodchopper's Lane, R.R. #1
Kettleby, L0G 1J0
Tel (905) 775-3783

Department of Plant Agriculture, Simcoe
Box 587 Blue Line Road
Simcoe, N3Y 4N5
Tel (519) 426-7127

Department of Plant Agriculture, Vineland
Box 7000, 4890 Victoria Avenue North
Vineland Station, L0R 2E0
Tel (905) 562-4141

Lab Services Division

www.uoguelph.ca/labserv/

Pesticide and Trace Contaminants
P.O. Box 3650, 95 Stone Road West
Guelph, N1H 8J7
Tel (519) 767-6200

Pest Diagnostic Clinic
Tel (519) 767-6256

APPENDIX G. The Metric System

Metric Units

Linear Measures (length)		
10 millimetres (mm)	=	1 centimetre (cm)
100 centimetres (cm)	=	1 metre (m)
1,000 metres	=	1 kilometre (km)
Square Measures (area)		
100 m X 100 m = 10,000 m^2	=	1 hectare (ha)
100 ha	=	1 square kilometre (km^2)
Cubic Measures (volume)		
Dry Measure		
1,000 cubic millimetres (mm^3)	=	1 cubic centimetre (cm^3)
1,000,000 cm^3	=	1 cubic metre (m^3)
Liquid Measure		
1,000 millilitres (mL)	=	1 litre (L)
100 L	=	1 hectolitre (hL)
Weight-Volume Equivalents (for water)		
(1.00 kg) 1,000 grams	=	1 litre (1.00 L)
(0.50 kg) 500 g	=	500 mL (0.50 L)
(0.10 kg) 100 g	=	100 mL (0.10 L)
(0.01 kg) 10 g	=	10 mL (0.01 L)
(0.001 kg) 1 g	=	1 mL (0.001 L)
Weight Measures		
1,000 milligrams (mg)	=	1 gram (g)
1,000 g	=	1 kilogram (kg)
1,000 kg	=	1 tonne (t)
1 mg/kg	=	1 part per million (ppm)
Dry–Liquid Equivalents		
1 cm^3	=	1 mL
1 m^3	=	1000 L

Application Rate Conversions

Metric to Imperial (Approximate)		
litres per hectare x 0.09	=	gallons per acre
litres per hectare x 0.36	=	quarts per acre
litres per hectare x 0.71	=	pints per acre
millilitres per hectare x 0.015	=	fluid ounces per acre
grams per hectare x 0.015	=	ounces per acre
kilograms per hectare x 0.89	=	pounds per acre
tonnes per hectare x 0.45	=	tons per acre

Imperial to Metric (Approximate)		
gallons per acre x 11.23	=	litres per hectare (L/ha)
quarts per acre x 2.8	=	litres per hectare (L/ha)
pints per acre x 1.4	=	litres per hectare (L/ha)
fluid ounces per acre x 70	=	millilitres per hectare (mL/ha)
tons per acre x 2.24	=	tonnes per hectare (t/ha)
pounds per acre x 1.12	=	kilograms per hectare (kg/ha)
ounces per acre x 70	=	grams per hectare (g/ha)

Liquid Equivalents		
Litres/Hectare		***Approximate Gallons/Acre***
50	=	5
100	=	10
150	=	15
200	=	20
250	=	25
300	=	30

Dry Weight Equivalents		
Grams or Kilograms / Hectare		***Ounces or Pounds /Acre***
100 grams	=	1 1/2 ounces
200 grams	=	3 ounces
300 grams	=	4 1/4 ounces
500 grams	=	7 ounces
700 grams	=	10 ounces
1.10 kilograms	=	1 pound
1.50 kilograms	=	1 1/4 pounds
2.00 kilograms	=	1 3/4 pounds
2.50 kilograms	=	2 1/4 pounds
3.25 kilograms	=	3 pounds
4.00 kilograms	=	3 1/2 pounds
5.00 kilograms	=	4 1/2 pounds
6.00 kilograms	=	5 1/4 pounds
7.50 kilograms	=	6 3/4 pounds
9.00 kilograms	=	8 pounds
11.00 kilograms	=	10 pounds
13.00 kilograms	=	11 1/2 pounds
15.0 kilograms	=	13 1/2 pounds

Metric Conversions		
5 mL	=	1 tsp
15 mL	=	1 tbsp
28.5 mL	=	1 fl. oz

Conversion Tables — Metric to Imperial

Length		
1 millimetre (mm)	=	0.04 inch
1 centimetre (cm)	=	0.40 inch
1 metre (m)	=	39.40 inches
1 metre (m)	=	3.28 feet
1 metre (m)	=	1.09 yards
1 kilometre (km)	=	0.62 mile
Area		
1 square centimetre (cm^2)	=	0.16 square inch
1 square metre (m^2)	=	10.77 square feet
1 square metre (m^2)	=	1.20 square yards
1 square kilometre (km^2)	=	0.39 square mile
1 hectare (ha)	=	107,636 square feet
1 hectare (ha)	=	2.5 acres
Volume (dry)		
1 cubic centimetre (cm^3)	=	0.061 cubic inch
1 cubic metre (m^3)	=	1.31 cubic yards
1 cubic metre (m^3)	=	35.31 cubic feet
1,000 cubic metres (m^3)	=	0.81 acre-foot
1 hectolitre (hL)	=	2.8 bushels
Volume (liquid)		
1 millilitre (mL)	=	0.035 fluid ounce
1 litre (L)	=	1.76 pints
1 litre (L)	=	0.88 quart
1 litre (L)	=	0.22 gallon (Imp.)
1 litre (L)	=	0.26 gallon (U.S.)
Weight		
1 gram (g)	=	0.035 ounce
1 kilogram (kg)	=	2.21 pounds
1 tonne (t)	=	1.10 short tons
1 tonne (t)	=	2,205 pounds
Pressure		
1 kilopascal (kPa)	=	0.15 pounds/in^2
Speed		
1 metre per second	=	3.28 feet per second
1 metre per second	=	2.24 miles per hour
1 kilometre per hour	=	0.62 mile per hour
Temperature		
°F	=	(°C X 9/5) + 32

Conversion Tables — Imperial to Metric

Length		
1 inch	=	2.54 cm
1 foot	=	0.30 m
1 yard	=	0.91 m
1 mile	=	1.61 km
Area		
1 square foot	=	0.09 m^2
1 square yard	=	0.84 m^2
1 acre	=	0.40 ha
Volume (dry)		
1 cubic yard	=	0.76 m^3
1 bushel	=	36.37 L
Volume (liquid)		
1 fluid ounce (Imp.)	=	28.41 mL
1 pint (Imp.)	=	0.57 L
1 gallon (Imp.)	=	4.55 L
1 gallon (U.S.)	=	3.79 L
Weight		
1 ounce	=	28.35 g
1 pound	=	453.6 g
1 ton	=	0.91 tonne
Pressure		
1 pound per square inch	=	6.90 kPa
Temperature		
°C	=	(°F – 32) x 5/9

Abbreviations

%	= per cent (by weight)	km/h	= kilometres per hour
ai	= active ingredient	kPa	= kilopascal
AP	= agricultural powder	L	= litre
cm	= centimetre	m	= metre
cm^2	= square centimetre	m/s	= metres per second
DG	= dispersible granular	m^2	= square metre
DP	= dispersible powder	mL	= millilitre
E	= emulsifiable	mm	= millimetre
e.g.	= for example	SC	= sprayable concentrate
EC	= emulsifiable concentrate	SP	= soluble powder
F	= flowable	t	= tonne
g	= gram	W	= wettable (powder)
Gr	= granules, granular	WDG	= water dispersible granular
ha	= hectare	WP	= wettable powder
kg	= kilogram	km/h	= kilometres per hour

Spraying Application Record

Application Equipment Used:

Tank Capacity:	Nozzle Type & Pressure:	Comments:
Tractor Speed or Gear and RPM:		
Calibrated Application Rate per hectare or acre:		

Application Information							Environment Information		
Field Identification Location & Size	**Application Date & Time**	**Crop & Stage of Growth**	**Product (concentration)**	**Product (rate/ha or acre)**	**Water (rate/ha or acre)**	**No. of Tanks (per field)**	**Wind Speed & Direction**	**Temperature**	**Soil Moisture**

Emergency and First-Aid Procedures for Pesticide Poisoning

- Become familiar with the chemicals you are using. Keep a list of common names in case of accidents or emergencies. Common names are written on product labels and are cross-referenced in this publication. More extensive first-aid information is on product Material Safety Data Sheets (MSDS). These sheets are posted on company Web sites or are available from the farm supply centre where the chemical was purchased.
- If a pesticide comes in contact with the skin or is spilled on clothing, remove the clothing and wash the skin thoroughly with soap and warm water.
- If pesticide comes in contact with the eyes, rinse them continuously with clean water for 15 minutes. Repeat.
- If you suspect poisoning from exposure to a pesticide by swallowing, inhalation, or contact with skin or eyes, read the label on the pesticide container. Carry out the first-aid treatment suggested. Emergency phone numbers are listed on all product labels.
- **Immediately after first-aid treatment, wrap the patient in a coat or blanket and rush him/her to the nearest hospital. Take the list of chemical common names with you and identify the ones being used.**
- **If a person is unconscious, or lapses into unconsciousness, call an ambulance immediately.**
- **Emergency advice on pesticide poisoning is available from the Regional Poison Information Centres at: Toronto 1-800-268-9017 Ottawa (bilingual) 1-800-267-1373**
- **Those needing hearing assistance should call: 1-416-597-0215 (TTY) Emergency telephone numbers are listed at the front of each Bell telephone directory.**

  Fill in the following:

  My Local Poison Information Centre Telephone Number is:

  _____ - _____

For information, or to obtain copies of this or any other ministry publication, please:
call 1-888-4-OMAFRA (1-888-466-2372) from within Ontario, (519) 826-3700 from outside the province or OMAFRA's TTY line at (519) 826-7402 for the hearing impaired, email your request to *products@omafra.gov.on.ca*, or visit OMAFRA's web site at *www.gov.on.ca/omafra*.

A complete listing of all OMAFRA products and services, and order forms, are available on the web site. Orders can be faxed to (519) 826-3633 or mailed to Government Information Centre, OMAFRA, 1 Stone Road West, Guelph, ON N1G 4Y2

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